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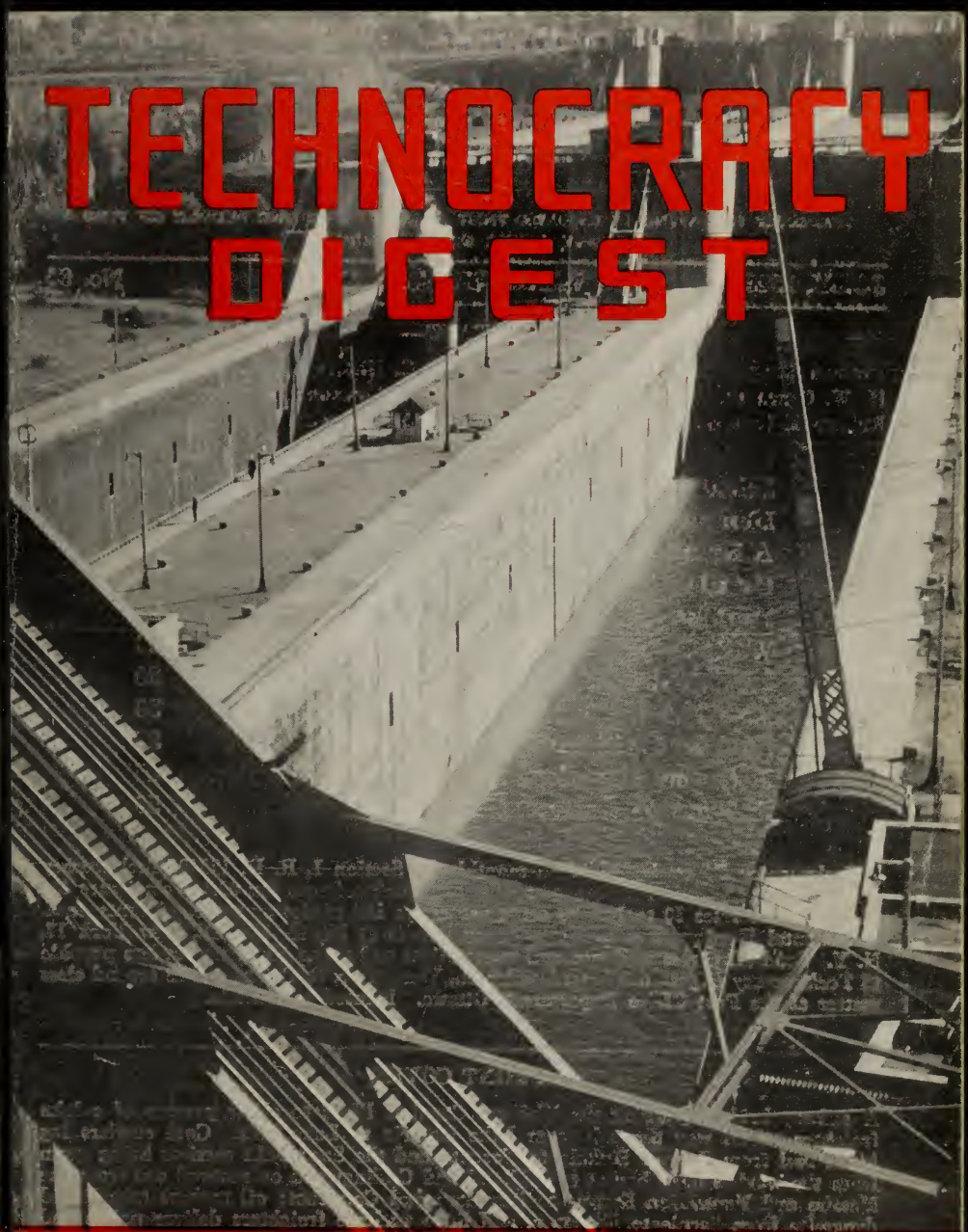

TECHNOCRACY DIGEST

JULY '45

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TECHNOCRACY DIGEST

THE ONLY MAGAZINE IN CANADA THAT IS PREPARING THE PEOPLE OF THIS COUNTRY FOR SOCIAL CHANGE

JULY, 1945 VANCOUVER, B. C. No. 85

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FRONT COVER

A railway bridge spanning the Welland Canal is lifted to allow passage of a lake freighter on its way through from Lake Ontario to Lake Erie. Coal carriers lug black fuel from Erie or Buffalo to Toronto and the Soo; bulk carriers bring grain from the world's breadbasket to Midland and Collingwood or rust-red ore from the Mesabe and Vermillion Ranges to Hamilton and Conneaut; oil tankers take liquid dynamite from Sarnia to Kingston, and little package freighters deliver paints and steel pipe and breakfast food from Montreal to Cornwall.

(NATIONAL FILM BOARD PHOTO)

Science's Greatest Opportunity

Technocracy, science in the social field, will achieve the most biologically significant event in human ecology, for it will have changed evolution from a haphazard selection through survival of the fittest to a planned progression for the arrival of the fittest.

TWENTY-FIVE years ago in North America there was formed a group of scientists and engineers headed by Howard Scott and known as the Technical Alliance. These men made a survey of the natural resources, energy consumption, physical equipment, and social structure of this Continent.

From the mass of measurable facts thus acquired there emerged the inevitable pattern that human affairs in this area must follow if our Power Age civilization is to continue. It was evident that the increasing use of extraneous energy would bring North America face to face with the most fundamental social change in history. Today twenty-five years later, we approach the crisis, and its nearness is being felt.

To meet the crisis—to usher North Americans into a new era of abundance for all—is the task that the Technical Alliance (now Technocracy Inc.) has set as the goal of twenty-five years of effort. No other organization on this Continent is prepared to meet that crisis.

Technocracy has the only blueprint that represents a coordination of measurable facts. No financial finagling or political phantasms will see North America through.

That crisis will offer only one chance—take it or leave it. If the citizens of this Continent follow Technocracy's blueprint, they will enter a greater civilization than the world has ever known.

Science has dared many things, but here at last is its greatest opportunity. Technocracy, science in the social field, will achieve the most biologically significant event in human ecology, for it will have changed evolution from a haphazard selection through survival of the fittest to a planned progression for the arrival of the fittest.

—The Editor

Men and Molecules

Do the scientists, technologists, and engineers of this Continent realize that the technological application of physical science to the means whereby people live has made government by science imperative and inevitable in this area? —HOWARD SCOTT

'AW, for Pete's sake!' said John Jones.

He snapped shut his magazine with such violence that his travelling companion turned with a start from his peaceful contemplation of Canadian scenery flitting past the train window.

'Sorry,' Jones apologized, 'but I just can't help blowing off steam every time I read that nylon stockings are made from coal, water and air. Now I'm not saying it can't be done, mind you, but it's how it's done that puzzles me, and these articles never tell you anything about that.'

He turned his chair to face his companion.

'Maybe you haven't thought much about the problem, but with me it's different,' he went on, with an air of professional pride. 'You see, I've been in the coal business for 30 years and a lot of people look upon me as sort of an expert in my own line. You'd be surprised the fantastic notions this coal, water and air stuff gives them. Some of them think you make nylon by whipping up coal dust in water, as you would mayonnaise, or by melting the stuff like beeswax. Now, I can tell them they're away off the beam, but when they say 'all right, you tell us how it's done', I'm stumped. What's more, a lot of people can't understand why nylon stockings used to cost $1.65 a pair before they went off the market a couple of years ago—air is free, water almost free and I sell the best coal for $16.50 a ton.'

The tall man in gray tweeds grinned amusedly and fumbled in his pockets for his pipe and matches.

'You know, you've got something there,' he remarked, 'and I can certainly see what's bothering you. At the same time we chemists don't always find it easy to go into detail on these matters using simple everyday language.'

Reprinted from C-I-L OVAL.

John Jones looked upon his companion with new interest. 'A chemist eh? I've always wanted to meet one of you fellows and find out how you perform your magic tricks—making plastics from sawdust, wood from cow's milk and peanuts, raincoats from limestone. Especially this business of making nylon stockings from coal, air and water. Sounds like sheer magic to me.'

'Things like nylon don't just happen.' The Chemist emphasized. 'It may surprise you to know that it took about ten years of intensive research and an expenditure of possibly ten million dollars before the commercial production of nylon was made possible. And even then it was necessary to erect huge, complicated and costly chemical plants before nylon could be put on the market in worthwhile volume.'

'Phew! Ten years and ten million dollars, and then all that plant on top of that,' Jones ejaculated. 'No wonder nylons used to cost $1.65 a pair. But I'd certainly like to know how they are made from coal, water and air.'

'Well, there's a lot of chemistry between a hunk of coal and a hank of nylon,' said The Chemist, 'and it's hard to know just how much to tell and where to begin.' He settled himself comfortably in his chair and lit his pipe.

'Look,' he went on. 'We have lots of time. Suppose we just ramble along for awhile. We chemists sometimes find it hard to understand what there is about our profession that mystifies the average person. So you ask the questions and I'll try to answer them.'

'Swell!' said John Jones. 'First of all maybe you can tell me in a few simple words what chemistry is all about. I do mean simple though—I didn't even touch the subject in high school.'

'That's a tall order, asking me to define chemistry right off the bat,' said The Chemist. He paused for a moment and gazed thoughtfully out of the window.

'Let me put it this way,' he began hesitantly. 'What we chemists do is study the composition of Nature's products. We try to find out how we may change them to suit our own purposes, and we observe how Nature works so that we may learn to create new substances which are better adapted to man's needs than any natural materials.'

'The study of Nature's ways,' he continued, 'may be said to fol-

low two paths, analysis and synthesis. Analysis means breaking down into parts or original elements. Synthesis, a comparatively modern achievement, means putting together, or building up.'

'Now I've got it,' said Jones, slapping his knee. 'I can see what synthetic really means. And I've always thought synthetic was just another word for a poor substitute for a natural product—artificial, so to speak.'

'A great many people make that mistake,' said The Chemist. 'The meaning of the word "synthetic" was distorted in much the same way as the word "artificial", which originally meant "made by a craftsman." It all arose from the popular fallacy that Nature's products are flawless and that man-made products are at best mere imitations. Actually, even when the chemist has imitated Nature, he has often been able to go much further and develop products that eliminate many of the faults in the natural prototype.'

'You are not trying to tell me that man has actually excelled Nature in creating things?' Jones asked incrediously.

'From man's point of view,' said The Chemist, 'certain man-made things are superior to anything found in Nature. But remember, Nature's purposes are usually quite different from man's. Silk clothing was not intended as a gift of Nature to man. In some respects silk is inferior to nylon as a textile, but it is highly doubtful if you could convince the silkworm that nylon would suit his purposes as well as Nature's product.'

'That's very interesting,' said John Jones. 'But tell me more about the synthesis business. You said something about it being a modern achievement.'

'Modern in the sense that the chemical theories on which modern synthesis is based were developed during the 18th and 19th centuries,' The Chemist replied. Probably the most interesting of these theories is the idea that everything is composed of tiny particles. This idea was first suggested by the ancient Greeks, who called them atoms, which is the Greek word for indivisible. But it was not until the beginning of the 19th century that the theory of atoms was put forward in a scientific way.'

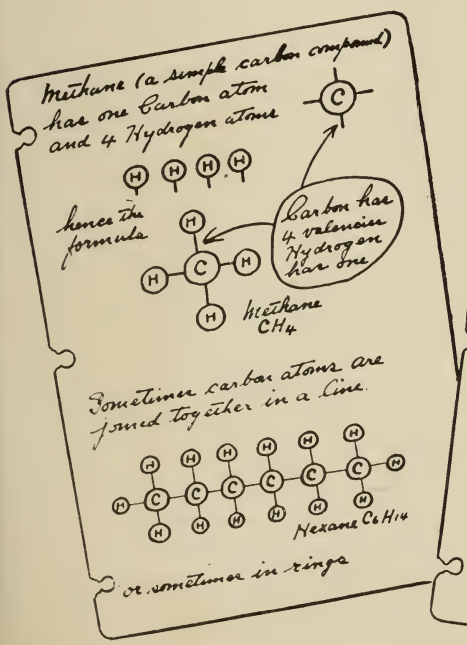
'Now, there's something I'd like you to explain to me,' Jones suggested. 'I've got a general idea what atoms are, but I'd like to

know how you chemists figure that everything is made up of such tiny things. What do they look like?'

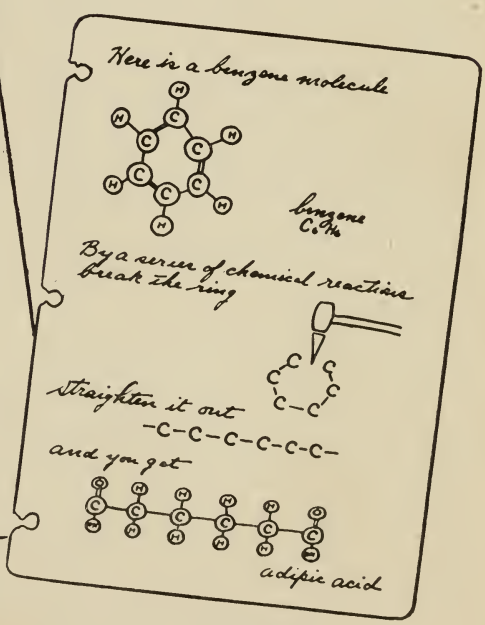
'It's not very easy to describe an atom; no one has ever seen one, or is ever likely to,' The Chemist said. 'They are too small to examine even with the most powerful microscope. In fact it's misleading to call them particles at all. They are more like planetary systems made up of even tinier particles whirling around in space.'

'That makes it even harder to imagine how atoms can be built up into anything,' said Jones. 'What holds them together anyway?'

'Atoms cling to one another by bonds called valencies,' The Chemist explained. 'The structural units built up in this way are


Methane (a simple carbon compound) has one Carbon atom and 4 Hydrogen atoms
hence the formula
Carbon has 4 valencies Hydrogen has one
Methane CH4
Sometimes carbon atoms are joined together in a line
Hexane C6H14
or sometimes in rings

Page One



Page Two

called molecules and molecules in turn can be joined together in various ways . . . '

'First atoms, which are mostly space, now valencies and molecules!' Jones interrupted. 'You're away over my head.'

The Chemist drew a notebook from his pocket. 'Don't let it worry you,' he said. 'The value of this sort of theorizing is that it enables us to represent chemical changes in terms of the interaction of atoms and molecules.' He sketched two simple formulae on a page of his notebook. **(See page one of Chemist's notebook illustrated).**

He went on to point out that chemists have so far been able to identify nearly 100 of the primary atoms, which they call elements. 'The commonest elements in living things are carbon, hydrogen, oxygen, nitrogen and sulphur.'

A slightly bewildered look still clouded Jones' countenance. 'I can follow you up to a point,' he said, 'but I'll be blowed if I can understand how you can get from these chemical elements to common, everyday things—like the wood in that match you're holding, for instance.'

'All right, let's see what the wood in this match is composed of,' The Chemist replied. 'When I burn it, in effect I will be breaking it up into its chemical components. Most of the match will disappear as carbon dioxide and water vapour, which are formed when the heat of the flame causes oxygen from the air to combine with carbon and hydrogen in the wood. The remaining ashes will contain essential mineral substances which the tree took out of the earth.

'You will probably be surprised to learn,' he continued after pausing to light up, 'that most of the tree from which we got this match came from the atmosphere in the first place and not from the earth. From the carbon atoms taken from the air's carbon dioxide, complex carbohydrates are formed in the leaves of trees with the aid of water and sunlight. Among these carbohydrates is cellulose which comprises the bulk of the tree's trunk, branches and leaves.

'It may seem incredible, but from these simple substances, carbon dioxide—the same gas that fizzes in your soda pop—water and minerals, Nature builds up our forests, grass, fruits and flowers, which in turn provide sustenance for all living things

on earth, be they animals, birds, insects, fishes, chemists or coal dealers.'

'I guess Nature's chemistry makes you fellows look like pikers in spite of your nylon,' said John Jones. 'But look here. With carbon being used up all the time by plants, isn't there danger of the supply running out?'

'Not at all,' answered The Chemist. 'The supply is constantly being replenished. Carbon dioxide is a compound of one carbon atom and two oxygen atoms. Plants use up the carbon and set the oxygen free. Animals in turn, breathe the oxygen of the air, combine it with carbon which they have taken into their bodies from vegetation, and breathe out carbon dioxide. Burning and rotting of plant and animal tissue also serve to restore carbon to the air.'

'That's an interesting cycle,' remarked Jones. 'Plants get their carbon from the air, and the air gets its carbon in a roundabout way from plants. Which came first in the beginning, the plants or the carbon dioxide?

'You might as well ask which came first, the chicken or the egg,' laughed The Chemist.

He went on to explain that although most of the carbon taken from the air by plants is restored eventually to the atmosphere, some of it is sidetracked and stored up for millions of years in the form of coal, oil or natural gas.

'Gosh, that's true,' Jones commented. 'A few years ago I had a chance to go down in a coal mine in Alberta, and they showed me the imprint of a giant tropical fern embedded in a coal seam. They told me that fern just about tells the whole story of the vegetable origin of coal.'

'Fossils such as that could tell an even more dramatic story,' The Chemist said with a twinkle in his eye. 'Several millions of years ago, it is not unlikely that fern absorbed some of the carbon atoms exhaled by some nightmare prehistoric monster. It is rather amusing to think that modern organic chemistry can unlock the breath of our ugly friend, the dinosaur, after several millions of years of imprisonment in coal, and turn it into nylon stockings.'

'Whoa, now,' Jones broke in, and a long derisive toot of the train whistle echoed his words. 'Imagine me explaining to my customers that nylon is really

made from dinosaur's breath! But organic chemistry is a new one on me. How is it different from any other kind of chemistry?'

'To put it simply,' explained The Chemist, 'organic chemistry deals with the compounds built up around carbon. As I have already indicated, all plant and animal life is built up primarily of carbon. Inorganic chemistry, on the other hand, is concerned principally with materials derived from the minerals of the earth.'

The Chemist went on to explain that not only plant and animal life, but also the compounds synthesized by organic chemists owed their existence to a remarkable property of the carbon atom. 'As I have already indicated here,' he added, pointing to the sketches in his notebook, 'the carbon atom has the ability to combine with itself, as well as with other elements, and in this way extremely complex molecules are formed.'

'You know, this stuff is really interesting to me,' Jones said. 'I've been in the coal business for 30 years, and this is the first time I've realized why coal is so important other than a mere fuel. From what you tell me, it is the carbon in coal that is the whole heart and soul of this business of organic synthesis.'

'Not just carbon,' The Chemist hastened to explain, 'but carbon which has already been built up by nature into complex compounds. By preserving intact the structure of these carbon compounds, we are saved the difficult first step in building up many synthetic products. When building a house it's nice to be able to buy prefabricated parts like walls, doors, windows and even bricks, instead of having to start by cutting your own wood and baking your own bricks.'

He went on to explain that the arrangements or patterns formed by atoms and molecules determines the nature of the finished products.

'I see,' said Jones. 'Just as an architect can design totally different houses by different arrangements of the same building materials.'

'Yes, but remember that the variety possible in chemistry's architecture makes it hard to imagine that there is any similarity in the basic materials,' said The Chemist. 'Ready made, built up carbon compounds such as benzene obtained from the black, sticky stuff called coal tar, are the source of an amazing variety

of things—ingredients of military explosives, dyestuffs, drugs, perfumes, and a host of other products including our relative newcomer, nylon.'

'Now we're getting somewhere,' said Jones eagerly. 'Let's see if I understand what you're driving at. You said that carbon compounds are the materials chemists use to make their synthetics. Now you say that nylon and a lot of other things are made from benzene, which you get from coal. How does all this add up to nylon stockings?'

'It's all because the benzene molecule, besides being a readily obtainable carbon compound, was discovered to have the very structural characteristics that were needed for synthesizing nylon,' said The Chemist. 'Let me tell you how it all came about.'

He paused to refill his pipe and rubbed the bowl reflectively along the side of his nose.

'Nylon,' he began, 'was discovered as a result of research begun purely as a quest for knowledge regardless of its immediate practical value. A group of Du Pont research chemists, headed by Dr. Wallace H. Carothers, believed they could rival nature in one of the most amazing and baffling of all her chemical feats, the creation of giant molecules. Nylon is one of these giants—of the long chain variety.'

He explained that giant molecules are built up by linking together a large number of simpler molecules in various patterns. In silk, wool, leather and many other common natural materials, the molecules are linked end to end in chains of great length.

'You see,' he went on, 'the secret of the strength of silk and nylon is in the length of its molecular constituents. Physicists claim that these long thin molecule chains, ranged side by side, cling together better and resist rupture because of their length just as the spinner of yarns knows that he must choose long fibres and card or comb them straight if he would have strong threads.'

Jones pulled a tiny woolen fibre from his suit. 'Is this a giant molecule?' he asked.

'I'm afraid there are millions of giant molecules in that single fibre,' the Chemist answered.

'Now you're getting me confused again,' Jones objected. 'Invisible chains of invisible molecules made up of invisible atoms. I don't see it!'

The Chemist pointed out the

window. 'Think of it this way. Imagine your individual wool or nylon fibres as made up of many long rows of box cars arranged side by side like those you see in that freight yard, with the single box cars linked end to end just like they are. If you have enough of these molecular trains, arranged in this way,—and it certainly takes a great many—you have your visible fibre.'

'That makes it clearer,' Jones admitted. 'But do you mean to say that those chemists actually succeeded in making these invisible freight trains?'

'What's more they found the molecular box cars in the coal you've been selling for 30 years.' He took up his notebook and showed how the benzene molecules straightened out to form the units in the molecular chains of nylon. **(See second page of Chemist's notebook.)**

'The straightening-out process is not as simple as it sounds,' he went on. 'If you want me to explain how the chemist does it, you'd better get ready to duck the big words. It is done by putting the molecules through the successive torturings of pressure hydrogenation, distillation, oxidation, neutralization, dehydration, hydrogenation again, crystallization and filtration.'

'Simple as all that?' said Jones with a hearty laugh. 'I'll bet you can't say it again.'

'It's hardly necessary,' chuckled The Chemist. 'You've got the general idea without g o i n g through all the details. When they are straightened out these units are linked together end to end by the same type of chemical bonding that characterizes silk and wool. This linking up process is called condensation polymerization and what we have now is nylon polymer flakes. These we must melt, extrude through tiny holes, stretch 400 per cent, twist, size and wind on bobbins. We now have nylon yarn and somebody else has still to knit it, seam it, steam it, scour it and dye it before the metamorphosis from coal to stockings is complete.

'Wait a minute,' challenged Jones. 'Where do the air and water fit in? So far you've only mentioned coal.'

'To put it simply,' The Chemist said, 'air and water are brought into the picture by ammonia, which is of vital importance in the tongue-twisting list of chemical processes I spieled off a moment ago. Ammonia is made from

nitrogen which we get from the atmosphere, and hydrogen, which is obtained from water.'

As he spoke the train jolted to a stop and The Chemist looked out of the window. 'Why, the next stop is mine,' he said. 'Time hasn't dragged on this trip.'

'This has been a lucky break for me,' said Jones. 'Thanks to you I've learned there's more to chemistry—and coal—than I ever dreamed. But there's one more thing that's bothering me. You say these atoms and molecules, even the giant ones, are too small ever to be seen. I can't help wondering how on earth you fellows get at them, how you handle them and make things with them.'

'That's a very natural question,' said The Chemist. 'The fact is that we don't need to see our molecules or put tags on them before we know how to handle them. The science of organic chemistry has enabled us to know in advance how the different types of atoms and molecules are going to behave when they are brought together. We have learned how to break up the combinations of atoms and molecules found in Nature's carbon-containing materials and how to form the new alliances we desire.'

'Sort of a high pressure marriage and divorce agency, eh?' said Jones.

'You're closer to the mark than you may realize,' laughed The Chemist. 'We even have chemical "Marying Sams", known as catalysts, which have the ability to perform marriages, high pressure or otherwise, between the elements in the molecular world, while they themselves remain blissfully single and unattached.'

'Well, what do you know about that!' said Jones.

'What's more, if any of our tiny customers are reluctant, we don't hesitate to turn on the heat.' The Chemist went on. 'You see, heat increases the activity of atoms and molecules and often causes them to fly apart, thus providing them with opportunities to make new alliances and form new compounds. You've heard of petroleum molecules, which provide a bountiful source of small carbon compounds useful in synthetic chemistry, notably in the production of synthetic rubber which is produced in Canada's great synthetic rubber plant at Sarnia. Again, the extreme heat of the electric furnace is used to cause a chemical rearrangement of atoms. Lime reacts with carbon

in the furnace to form calcium carbide, from which we get acetylene, which is basic in the preparation of numerous synthetic products, for example the synthetic rubber neoprene.'

'Say, that reminds me,' Jones broke in. 'I happen to know you get that coal tar stuff you mentioned earlier by heating coal without allowing any air to get at it. Is that another way of using heat to separate atoms and molecules?'

'It most certainly is,' said The Chemist. 'The process is called coking, and it forms a vapour from which the coal tar is condensed. But perhaps the best examples of the use of heat and pressure in manhandling molecules are to be found in high pressure synthesis, the source of hundreds of useful chemicals serving a thousand and one purposes. Not the least of these chemicals is ammonia, which I mentioned to you in connection with nylon.'

He explained that some ammonia is obtained in the coking process along with coal tar, but the vast quantities of ammonia needed by industry necessitates a more bountiful source of the chemical, such as high pressure synthesis. 'The development of synthetic ammonia helped free mankind from dependence on diminishing natural nitrate deposits. Ammonia is not only important for nylon, but it is the source of nitrates which are of tremendous value to the nation, in wartime and in peacetime for explosives and fertilizers.

'In high pressure synthesis we really do take our molecules for a joy-ride,' he went on. 'We heat them to terrific temperatures, wash them and re-wash them, cool them hundreds of degrees below zero, expand them to atmospheric pressure, compress them with pressures of thousands of pounds per square inch, and expose them to catalysts.'

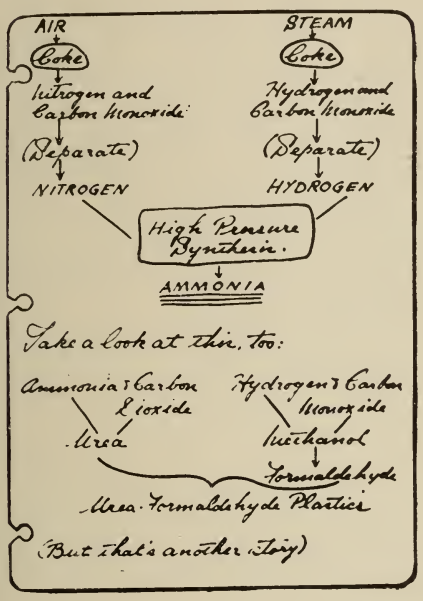
'No wonder the molecules combine,' said Jones. 'How could anything resist such methods of persuasion. But you said air and water are used in the production of ammonia. Can you give me a clearer idea of how it's done?'

'It all starts with the coke from our coking ovens,' The Chemist said. He began sketching on a third page of his notebook. 'When air is blown through hot coke, you get carbon monoxide and nitrogen. When you pass steam through hot coke, you get hyro-

gen and carbon monoxide. From the nitrogen and hydrogen so obtained, with the help of compressors, catalysts and heat, you make ammonia. '

'Sounds simple enough,' Jones commented.

'Simple in principle, but the plant equipment needed is far



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from simple,' said The Chemist. He began rummaging in his brief case. 'Did you ever hear of the Du Pont high pressure synthesis plant at Belle, West Virginia? To give you an idea of its size, the plant pumps enough water to supply a fair-sized city and the daily coal consumption is sufficient to heat a large home for more than a century.'

'Some customer!' Jones said with a covetous note in his voice.

'Here, take a look at these pictures,' The Chemist continued. 'They will give you a much more vivid impression than my words could ever convey of the tools and equipment needed by the modern chemists to break into coal's chemical treasurehouse and make use on a worthwhile scale of its energetic, versatile molecular components.

'Any time you are tempted to think that turning coal into synthetics is a simple matter, just think of these furnaces belching white hot masses, these towering gas holders, mighty pressure reactors, forests of stills, filters, pumps, blowers, centrifuges, autoclaves and tanks, and the mazes of piping and wiring you see here. On those pressure gauges the needles may be quivering at 10,000 pounds per square inch, these thermometers are probably recording thousands of degrees Fahrenheit, and the flow meters over here register the

passage of gases and liquids in millions of cubic feet or gallons a day.

'Planning and directing all this activity are the research chemists, the metallurgists and the engineers in laboratories and workshops, who fashion the formulae, the catalysts, the stainless steels and work out the processes that must first be put together in blueprint form.'

He got up to put on his hat and coat. 'The next time your acquaintances talk about whipping up a batch of nylons out of coal, air and water,' he added, 'you can tell them to stop wondering how to make a fortune out of the contents of their coal bin. The best use they can make of it is still just to burn it.'

'I'm sure looking forward to seeing some of those fellows again and telling them what I've learned from you,' said Jones. 'But gosh! It does seem a shame to waste so much coal by merely burning it!'

'It's not wasted,' The Chemist reminded him. 'Remember what I told you about the carbon returning to the air as carbon dioxide when the coal is burned.'

Jones' face brightened into a smile. 'Say, that's right. In a sense I'm helping in Nature's carbon cycle—returning or borrowing some of the carbon to make things that Nature didn't provide ready made for us. You know, we're in an interesting business!'

'We certainly are,' The Chemist agreed and made his way toward the train door.

★ THE YOUNGEST ADULT IN CANADA can remember the despair which swept the country during the depression. In 1938 there were 700,000 Canadians without employment and 1,500,000 people were living on direct relief. Even as late as 1940 the number on relief was scarcely less than three quarters of a million.

Yet today we have full production and full employment. There is a useful job at decent pay for every man and woman who wants to work. If a man does not want to work the law can compel him to do so. Unity of purpose in the struggle against our common enemy has brought about this miracle. We have been united to do something and we have done it.

We shall need the same sort of unity after the war if, as is the declared policy of the government, we are to provide jobs and security for all. In some respects this is going to be a tougher job even than the war itself. Never before in peacetime, not even in boom periods, have we achieved such an objective for every citizen. No wonder then that this is urgent business in the minds of many Canadians.

—A Citizen's Forum—*Of Things to Come*

A Hundred Million Tireless Slaves

If we install a new method of distribution and shorten working hours, our 10 million horsepower of hydro-electric energy can be a blessing; otherwise, we shall be cursed with technological unemployment and reduced consuming capacity in the postwar period.

OFFICIAL information places the Dominion's present hydro-electric development at 10,000,000 horsepower. Such a volume of electrical production approximates one horsepower of extraneous energy for the use of every man, woman and child in the Dominion.

Like a lot of other scientific data, we are apt to dismiss this item without appraising its full significance, yet around this bit of factual information revolves potentialities and problems directly affecting our future as a nation, and our individual well-being.

On the face of it, 10,000,000 horsepower of hydro-electric energy for the use of less than 12,000,000 people looks like a tremendous asset. From a national viewpoint that conclusion is fully justified, yet from the viewpoint of the masses and their welfare, it could become a serious menace.

Undoubtedly this flood of cheap power (which can be greatly increased) places Canada in a position to become a great industrial nation. The almost miraculous expansion of our industrial productivity during these war years attest that fact. An abundant source of cheap power, plus natural resources, plus expert labor, add up to immense productive capacity. Canada has all these things in a measure exceeded relatively by no other nation. From the national viewpoint this Dominion is incalculably rich. Prospects for future prosperity are brilliant.

What about the individual welfare? Look once again at the scientific fact—one horsepower of extraneous energy for every man, woman and child in the Dominion. The energy expressed in one horsepower is equal to the energy of 10 men. In other words, each person in Canada has at his or her disposal the energy of 10 men, each willing and able to work 24 hours a day for 365 days in the year. This means that if

the whole of this available energy is continuously used (as it is now all being used mostly for war production) we could, in a few short years, pile up such stores of goods as to flood not only our domestic market, but plug up a great deal of available foreign market outlets.

That would mean within a limited period the development of a new unemployment problem of unique proportions, unless in the meantime we evolve an entirely new system of distribution and introduce regulation of working hours.

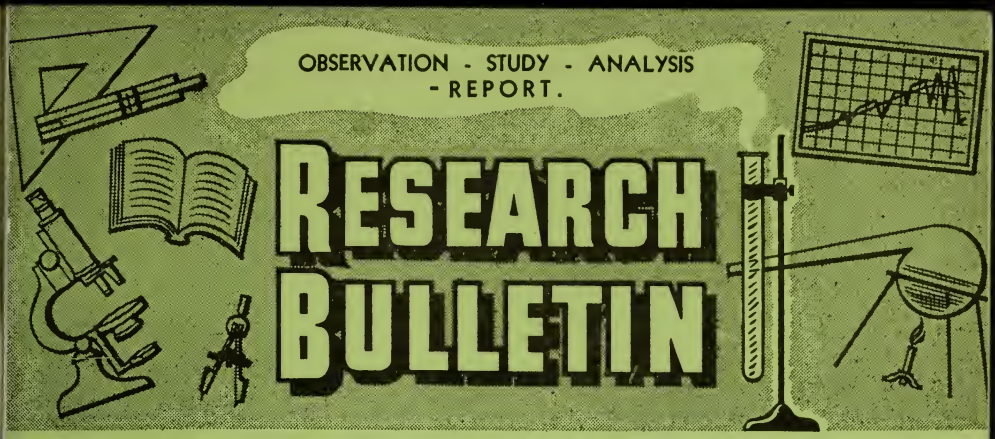
Nor is this by any means a fantasy of the imagination. Productive resources of 1929, together with a retraction of purchasing power, created a world depression of appalling dimensions. But the productive capacity of 1929 has been far exceeded through the development of more extraneous power, more plants and more trained workers. Add to our present Canadian domestic productive capacity the millions of men and women now engaged in war work or services and some idea is gathered of Canada's vastly increased creative power, yet up to the present moment no change in our economy has been devised to meet the situation.

When world economy has been evolved upon a sane basis actuated only by the purpose of serving the common good, this reserve of energy and productive power will become a boon and a blessing to mankind. Till then it could become a curse to four-fifths or more of the human family.

—The North Battleford Optimist

★ OTTAWA.—Canadians are paying cash for the goods they want to buy to a far greater extent than a few years ago, it was disclosed in the annual report of the Prices Board. In 1941, 68% of department store sales were for cash. Last year the percentage had reached 76. Jewelery sales were 48% cash transactions in 1941, and now are 70% cash. Cash sales of clothing increased from 53% to 64, and of furniture from 21% to 40. —Canadian Press

★ IN NO YEAR since the beginning of the war have newsprint operations in Canada averaged 80% of effective mill capacity. Best years in this respect were 1940 and 1941, when production from Canadian mills averaged 78.3% of capacity and 78.9% of capacity respectively. In 1944, average production of the Canadian mills was equal to only 63% of their capacity. —Pulp & Paper Industry



JULY, 1945 Prepared by Editorial Staff No. 30

Canada's Lumber Industry

SINCE 1939 Canadian forests and Canadian lumbermen have produced 25,000,000,000 board feet of lumber—more than was ever before produced in a corresponding period of the nation's history. In 1944 alone the output was more than 4,700,000,000 board feet, of which about 43% was exported. Had this all been sawn into ordinary building lumber it would have been enough for the construction of some 400,000 houses or, in another form, for 147,000,000 railway ties—enough for a track around the world.

The sawmill industry proper employs between 40,000 and 50,000 men. Production of sawlogs gives work equivalent to year-round employment for 30,000 to 40,000 men. With boxmakers, furniture craftsmen, wholesale and retail tradesmen, etc., the total may be 200,000. In actual cash, the industry creates new wealth of about $200,000,000 a year and provides nearly $50,000,000 in wages.

In view of the immensity of the industry, the question of reforestation is important. Between the cutting of lumber, pulpwood, pitprops, railway ties and other types of wood and ravages by insect and fire, the raw material is probably being used up faster than it is being replenished. Of the total annual depletion of merchantable ma-

terial, only about 74% is used. The remaining 26% is lost by fire, insects or lack of utilization.

The matter of perpetuating the nation's forest yield is more important than ever, for two reasons: the need to provide employment for the largest possible number of Canadians after the war; the increasing, new and interesting uses for forest products which are being developed. More progress has been made along this line in the last three years than in the previous 100 years.

Forests now yield alcohol, dyes, baking powder, medicines, paints, perfumes, sugar, gumplastics, yeast, ink and hundreds of other items. During the war pulpwood has taken the place of cotton in 'gun-cotton', and plywood has taken the place of metal in the fabrication of the Mosquito, the fastest fighter bomber in the world.

An important feature of these wartime developments in the utilization of wood has been the stimulation it has provided for energetic research. The most spectacular use of wood during the war has been in the field of chemicals. The lead in this direction has come largely from Europe, where shortages have made necessary the use of wood as a source of motor fuel, lubricants, cattle fodder, synthetic rubber, anti-freeze, explosives and a wide variety of other materials. Some of these developments will have only a wartime application, but the mere fact that research has been stimulated may mean much to the forest industries of the future.

Canada is actively engaged in such research. The forest production laboratories under the Department of Mines and Resources have added to their pre-war facilities several new laboratories and much new equipment. These include a glue laboratory, an improved wood laboratory, a wood plastics laboratory, some plywood equipment of a semi-commercial size, a wood hydrolysis laboratory, a large press for fabricating laminated structural units, equipment for moulding plywood over curved surfaces, two high-frequency electric units for work in the rapid setting of glued structures and for use in the seasoning of special units or assemblies and a considerable amount of ancillary equipment. These additions to the facilities have been useful as a wartime necessity, and their part in the post-war encouragement of the forest industries will be great.

At present the greatest demand for forest products is still for the old uses. Of the estimated 4,700,000,000 board feet produced last year, 640,000,000 feet went into boxes and crates, 470,000,000 feet were used by the railroads, 175,000,000 feet by essential mines, 60,000,000 feet for miscellaneous purposes, 1,455,000,000 feet for construction and shipbuilding in Canada, and the balance, amounting to about 1,900,000,000 feet, was exported for war use.

Despite all labour shortages and supply and equipment difficulties, production of lumber in Canada since the war began has averaged nearly 1,500,000,000 feet a year more than production averaged in the 10 years prior to the war. This represents an increase of about 40%. Production in 1944 exceeded that of 1943 by approximately 100,000,000 feet, and 1945 production is estimated to show a further increase of 100,000,000 feet. Despite the fact that Canada has been the main source of supply for the United Kingdom and the British Commonwealth countries under war conditions, and the fact that consumption of lumber in Canada for military purposes has been tremendous, the industry in addition has been able to supply sufficient lumber to provide a substantial increase in housing construction.

The average number of houses built in Canada in the 10 years prior to the war is estimated at 15,000 a year, while the average number during the war has been 27,000 a year—an increase of 75%. There was enough lumber supplied to construct more houses in 1944 than were ever built in any one year in Canada in the 10 years before the war.

If all the sawn lumber and sawn ties are considered together, exports to the United Kingdom in 1944 were virtually the same as in 1943.

On the other hand exports to the United States increased by 152,000,000 board feet, and exports to all other countries, mainly in the British Commonwealth, increased by 44,000,000 feet.

The lumber industry is confronted with a record-breaking volume of orders. Production in 1945 is likely to be approximately 4,850,000,000 board feet. This production is scheduled to come from the provinces approximately as follows:

(Million Board Feet)

NOVA SCOTIA	300
NEW BRUNSWICK	300
QUEBEC	1,100
ONTARIO	600
MANITOBA	80
SASKATCHEWAN	90
ALBERTA	195
BRITISH COLUMBIA (interior)	435
BRITISH COLUMBIA (coast)	1,750
	4,850

Assuming a postwar production of not less than 4,500,000,000 feet annually, Canada probably can export each year a minimum of 2,000,000,000 feet. For Canadian consumption the making of boxes and crates will require about 400,000,000 feet; mines and railroads, about 600,000,000 feet; new construction and maintenance, 1,400,000,000 feet; and balance of 100,000,000 feet will be used for a wide variety of purposes.

The United Kingdom has already made arrangements to spend about $140,000,000 for the purchase of 2,400,000,000 feet of Canadian lumber in the two years after the end of hostilities in Europe. In 1940, the year of peak Canadian ocean shipments, exports to the United Kingdom were 1,617,000,000 feet compared to 1,200,000,000 feet expected after the war. Nazi air raids, buzz-bombs and shelling have destroyed more than 1,000,000 homes in the United Kingdom. In addition homes will have to be built for service personnel returning to the British Isles after the war.

Other allied and British countries will also be embarking on new housing programs, and Canadian lumber is certain to be in large demand. **—Canada At War**

EDITOR'S NOTE: *Because of the expansion of Canada's lumber industry during World War II, this country is in a position to produce the greatest abundance of building materials that this nation has ever known. Are Canadians going to make certain that this vast productive capacity is utilized for the provision of human needs after the war?*

Fuel for the Lamp of Aladdin

HISTORY will surely say that America's means of production was the deciding factor in the winning of World War II; that lend-lease enabled us to help equip our Allies—that American production sparked the heroic stand at Stalingrad and the later invasion of France—that it served as the Aladdin's Lamp of World War II.

Yet much of this production would have been impossible were it not for the availability of alcohol which is a necessary component in, among other things, munitions, medicines, synthetic rubber, protective coatings, plastics, shatter-proof glass and lacquers. Nor could the production of alcohol have been possible on the present huge scale, were it not for the equipment in the beverage distilleries available for immediate conversion as soon as it was needed after Pearl Harbor.

When the War Production Board ordered complete conversion in October 1942, about half of the distilling industry's volume, represented by some 35 of the largest distillers, was already concentrated on war alcohol output. The new order applied only to high wine producers, comprising the remaining 90 of the country's 125 distilling companies.

In 1943, the beverage distillers produced 227.8 million gallons of 190-proof alcohol or more than half of all production: it is estimated that their output will account for about 45% of all 1942-44 alcohol production.

The production of industrial alcohol during the first World War did not play nearly as important a role as it does today. Prior to 1918, the only alcohols available to industry were methyl, ethyl, a mixture of the amyls (usually sold as fusel oil), and glycerol. However, the utilization of butanol in the lacquer industry and the rapid growth and expansion of the latter stimulated interest in other alcohols. Thorough investigation of methods of synthesizing these products has resulted in their commercial production, and at the present time, many alcohols are produced synthetically.

Alcohols, characterized by the fact that they contain the hydroxyl (OH) group, are the most important industrial organic group of chemicals. Lower alcohols are well known as anti-freeze compounds, solvents, germicides, and antiseptics; higher alcohols are known as general extractants, anti-foaming and flotation agents, while their sulfate salts are excellent wetting, emulsifying and cleansing agents. Chemically, alcohols are valuable starting points in the manufacture of many other products, such as its wide use in dyestuffs, drugs, cleansers, polishers, extracts, while in solvents it serves excellently for most gums, alkaloids and oils. It is also used in rubbing compounds, lotions, liniments, liquid soaps, and antiseptic solutions. The extensive use of alcohol is further illustrated by its presence as an anti-foaming agent for the photographic, varnish, paper coating, rubber latex, textile, printing, and ceramic industries. We find solvents widely used in many industries and for a variety of purposes. Consider, for example, their use in fire extinguishers, in hydraulic fluids for automobile brakes, and the very large use of alcohols for anti-freeze purposes, which makes possible, in difficult atmospheric conditions, the operation of not only the automobile, but also the aeroplane, tank, jeep, etc. The chemical industry is quite dependent upon the alcohols as solvents, for purification, extraction, and in crystallization processes; while the food and beverage industries utilize ethanol, glycerol and propylene glycol as solvents for the essential oils and coloring materials used in flavoring extracts, as mold inhibitors, and in other products.

Alcohol finds many uses on battlefields. Russian scientists not long ago developed a daring and novel method of using alcohol in abdominal operations. Directly after an abdominal wound has been closed surgically, from 50 to 70 cubic centimeters of distilled alcohol are pumped into the intestines, along with other food. This treatment, which usually takes place on the operating table, warms the pale and sick patient and eases him off into peaceful sleep.

One of the most dramatic examples of the myriad uses of alcohol was found in press dispatches and subsequently portrayed in a motion picture **Destination Tokyo,** which described how an emergency appendectomy was performed by a pharmacist's mate who tapped

a torpedo for the necessary alcohol to sterilize his makeshift surgical instruments, there being no other available antiseptic at the time.

Shortly after the United States was forced into the war with Japan, the Japanese seized virtually all of the natural rubber producing areas of the world and left America dependent on a brand new, untried synthetic rubber industry for its war needs. The stirring record of achievement of the synthetic rubber industry is history now, as is the vital role of the distillers which is best illustrated by the statement of Dr. Walter G. Whitman, assistant director of WPB: ' . . . it is fair to regard the rubber manufactured to date as being almost solely the product of the beverage industry which contributed 410 million gallons of alcohol to the war program, while the demand for synthetic rubber, direct military and lend-lease totalled 405 million gallons.'

Large quantities of alcohol are used in the manufacture of smokeless powder, each 16-inch shell consuming the equivalent of 19¾ gallons of alcohol when it is fired. The smokeless powder in a 155 mm howitzer high explosive shell requires the expenditure of almost half a gallon of 190-proof alcohol.

When the Allied armies first cracked the Normandy coast in the initial invasion of Hitler's European fortress, it was unofficially reported that 500,000 men were involved in the first invasion waves. It was announced that each man was equipped with three hand grenades. On the assumption of a 500,000 man force, that phase of the invasion preparations alone required almost 23,500 gallons of 190-proof alcohol.

Torpedoes, the tin fish with a sting, are being used with deadly effectiveness by submarines, destroyers and other naval ships. Few facts have been released by the Government regarding the construction and the use of torpedoes by either ships or planes, but it has been estimated that approximately 40 gallons of alcohol are used in the manufacture of a torpedo.

Any discussion as to the uses of alcohol during wartime would be incomplete if it failed to take into consideration the important medical use to which alcohol has been put for war.

Alcohol is one of the important raw materials in modern medicine

and is now saving countless thousands of lives on the scattered battle-fronts of this war. In the medical field, alcohol is used for sterilization and antiseptic purposes, and in a wide variety of drugs, basic medicinal chemicals and biologicals. Alcohol is an ingredient in ether and chloroform, sulfa drugs, aspirin, atabrine (a quinine substitute for fighting malaria), and in military protective salves. A new medical product of the distilling industry is the wonder drug of World War II, penicillin.

The introduction of a new alcohol is usually followed by a large number of its derivatives, and in the years to come there will undoubtedly be a number of new alcohols produced. It is expected that new synthetic methods and improvements in the older processes, coupled with the demands of industry in the postwar years, will further stimulate the development of new alcohols and new solvents. **—Jack J. Glasser in The Crown**

EDITOR'S NOTE: *Under the skilled research of our technologists during World War II a myriad of uses for industrial alcohol have been developed. These technologists are the real leaders of our Power Age civilization and the march of events will soon force upon them the overall direction of all social operations in North America.*

White Harvest

CRYSTAL-COVERED 'lakes' dotted across the Canadian prairies yield each year an unusual and valuable harvest of a widely used chemical compound, sodium sulphate.

For years the people on the prairies called the places 'stink holes.' The white alkaline deposits not only gave off a strange odor but in high winds they blew across the landscape like chalk. Then people began to find some value in these deposits, and, as so often is the case, they found these values purely by accident.

A farmer, homesteading near Palo, Saskatchewan, about the turn of the century, bought some Barred Rock hens, thinking they would bring in a little extra money. One day he was prowling along the shores

of White Shore Lake and happened to pick up some crystal-like deposits. He took the crystals home and mixed them with the chicken feed. His Barred Rocks ate the feed with disturbing results—for the crystals were crude Glauber's salt, used extensively as an aperient or purgative for cattle, horses and sheep.

Although the existence of natural deposits of sodium sulphate in Western Canada was well known more than 45 years ago, not until World War I was serious attention turned to these resources. The search for potash at that time led to the staking of claims on many of the saline lakes on the prairies. While they didn't find useful deposits of potash, this activity led to the discovery of large reserves of sodium compounds, principally in the form of sulphates.

Geologists suggest that the source of the salts in the deposits of Western Canada is from the unconsolidated drift material which covers practically the whole of the western plains. Circulating meteoric waters carrying calcium salts in solution release the sodium salts in the bentonite of the drift and these are in turn concentrated and deposited in the undrained lake basins in the surface deposits as found today. The meteoric waters which carry the salts into the basins may be surface drainage, seepages, or springs. There is no drainage outlet to these lakes and constant evaporation over the years has concentrated the weak solutions into the strong ones—an example of the work of nature's own laboratory.

Investigation of the deposits in White Shore Lake was undertaken by Canada's Department of Mines during 1924 and it was estimated that approximately 19,760,000 tons of hydrous salts existed in the 1,860 acre lake, which is 10½ miles long with an average width of half a mile. The deposits vary in depth from three to seven feet with an occasional depth of from 10 to 14 feet.

Today the expanse of snowy White Shore Lake is the heart of a thriving industry, with the plant of Midwest Chemicals Limited shipping thousands of tons of sodium sulphate each year. The bulk of this output is sold by the General Chemicals Division of Canadian Industries Limited.

Tens of thousands of tons of the dehydrated crystal, known to the trade as 'salt cake', are required each year in the manufacture of

kraft paper by the sulphate process, which was first introduced in Canada in 1907. The fibre obtained by the sulphate process possesses unusual strength and flexibility. Roughly speaking, 350 pounds of salt cake are required for each ton of sulphate pulp produced.

Canada's glass industry uses sodium sulphate to lower the melting point or viscosity of the liquid glass. Substantial tonnage of salt cakes are used in the smelting of nickel and copper ores, and in various branches of the chemical industry salt cake is an important ingredient.

Sodium sulphate, as it occurs in these deposits, is in the hydrous form of crude Glauber's salt which contains 56% water on crystallization, or in solution as a brine. Since very little of the material can be marketed in either of these forms it is necessary to purify or dehydrate it before a marketable product is obtained.

The harvesting of sodium sulphate is simplicity in itself. The whole process is governed by rainfall and melting snow. The water accumulating in undrained basins is often a foot or two in depth and carries a considerable quantity of the salts in solution.

In the late summer and especially in dry seasons the so-called lake becomes a huge deposit of crystallized salts. But when the seasonal rains or melting snows dissolve these crystals, the brine formed is pumped into a 23 acre reservoir where re-crystallization takes place and the almost 100% pure crystal is formed.

These deposits are harvested by modern methods, utilizing tractors with scrapers that look not unlike the bulldozers used for earth-moving projects such as highways and airdromes. Scrapers and a fleet of trucks combine to pile up huge reserve stocks at the Midwest Chemical plant thereby assuring continuous operation at the next stage.

A drag scraper hauls the raw salt from the stock pile into the plant where it is fed into three revolving drums, each 80 feet long and 7 feet in diameter. The furnace at the end of each drum maintains a temperature sufficient to drive off all the moisture and water of crystallization. The salt cake leaves the furnace end of the drum and now weighs 2,600 pounds per cubic yard as compared with 1,400 pounds to the cubic yard in its original state. From the

furnace it is taken to a screening and grinding operation where the salt cake is screened and ground to a marketable size.

By this moisture-removing treatment important savings are made. The original material, containing 56% water by weight, could be shipped in its raw state. But freight rates have to be added to the cost at the plant before the material can be landed at the larger markets which exist in the East. The conversion to salt cake, although adding to the cost of production, is a case of spending money to save money. Incidentally, the raw solution in the lake also contains some magnesium which is considered an impurity in most uses of salt cake and is therefore removed in the harvesting operation.

The finished dry salt is stored in a silo and shipped in bulk carlots as required by the trade. Canadian sodium sulphate is recognized as being a superior product because it contains virtually no free sulphuric acid or iron, and is not likely to form hard cakes or lumps during shipment or storage.

Looking like a huge snow drift, a stock pile of 150,000 cubic yards—representing 100,000 tons—of the raw deposit is generally maintained at the plant. The buildings, whitened by the blowing salt, look like something in a Christmas setting when viewed from afar against a blue prairie sky.

Midwest Chemicals Limited was organized in 1938 with Saskatchewan capital. Situated two miles from Palo, practically a whistle stop on the C.N.R. main line about 70 miles west of Saskatoon, the works is complete in itself, even to a school for children of the employees.

From a small and struggling beginning the company is today among the leaders in the sodium sulphate industries on the prairies. Its equipment is entirely modern, two big diesel units providing the power for round-the-clock operations that turn out a 'white harvest' that is shipped throughout the Dominion.

—Kenneth Liddell in C-I-L OVAL

EDITOR'S NOTE: *Canada is a treasure trove of natural resources. When they install technological control of social operations the people of this country will utilize those resources for the benefit of all citizens with a maximum of efficiency and a minimum of waste.*

New Glass Products

GLASS, ancient building material, in recent years has recaptured the imagination of industrial designers, architects and the public, and its added forms and uses appear to assure the material unusual prominence in postwar construction.

Recent experimentation, in many cases speeded by war, has developed some surprising products from this centuries old window material.

Glass ingredients now are emerging in blocks of foam-like materials or mats of a wool-like substance for heat insulation in walls and roofs; in fibre twisted into yarn for fireproof and mothproof textiles; in glass-plastic for molded structures and wall materials.

There are entirely new kinds of the ordinary transparent substance familiar in bottles, tumblers, windows, windshields and the like—safety glass that can be bent like heavy rubber; 'case-hardened' plate in solid glass doors.

And strange things have been done to ordinary plate and window glass so that it now appears in a dozen guises—glass that you can see through only one way; glass containing tint compounds that filter out the bleaching effect of sunlight, or that permit entry of energizing violet light, or that exclude sun heat in summer; glass in double or triple-size windows which provide heat insulation because they have two or three panes sealed together at the edges.

These are some of the glass industry's newer products for homes, offices and factories and many of them already have been released for civilian use. Some of them arrive with fairly high price tickets, but the industry holds out hope of cost reduction by the time the popular market and low-cost home have been reached in the course of distribution.

Canada's glass production is almost entirely confined to what the trade calls 'crown glass' used in making blown or molded containers. In the past, several factories set up to roll or cast flat glass for windows have had to abandon operations—they could not compete

with imported glass.

Pre-war, our imported glass came from Belgium, the largest exporter, England second, United States third; British glass came in duty free, but there was a 15% impost on the American product and 12½% on the Belgian. Incidentally, it is cheaper to ship from Europe to Vancouver via the Panama Canal than to send it overland from Montreal to Winnipeg.

The world's leading glass firms are represented in Canada, plants here trimming and bevelling imported glass for dealer distribution.

Fine fibres or filaments of glass represent one of the newest of new glass materials. Developed in United States by Owen-Corning Corp., it is made in Canada by Duplate Co., Oshawa, under the name 'Fiberglas.' It first proved valuable as an air filter but just before the war was being woven into all-glass fabrics that defy wrinkling, wear, moth or flame attack. Since then the fibres have been made smaller and, with production by Owens-Corning of a filament .00002-in. in diameter, a white, fluffy wool-like mass of glass has emerged for a new role in thermal insulation of buildings and machines. Today, it is used to insulate high-altitude bombers; soon it will be available for home building.

Before the war, European architects in France, Germany and Sweden led a trend in architectural design—houses, factories, department stores, hospitals, schools, etc.—featuring entire walls of glass. It was not long before this trend embraced Britain and began to take in the Americas.

Current industrial design in Canada, for example, features ever wider expanse of glass for factory walls and roofs and glass experts and some architects predict extension of the trend to commercial and residential structures.

Wide corner windows and almost wall-size windows generally now can be built into houses without danger of heat-loss in winter. Already in Canada, houses—so far in the higher cost category—are appearing one by one with 'picture' windows of this kind, affording a new degree of interior daylighting, spacious view and something entirely new in window insulation.

These windows are fabricated of high quality glass for clear

vision; they are made up of two, three or more panes welded together on all four edges by a newly developed metal-to-glass bond.

The problem that has always faced architects seeking the advantages of sunlight has been that although ordinary glass let in the warm rays of the winter sun, the heat was immediately dissipated by conduction. Windows were bitter cold to the touch; their chill resulted in frost deposits; they 'padded' the fuel bill.

Discovery of a method of bonding metal to glass has resulted in development of 'transparent insulation,' i.e., metal-sealed double-pane windows that exclude the cold by utilizing the captive air principle that is the foundation of most thermal insulation. Placing one's hand on the inside of a double-glazed window on a winter's day is like placing it on a solid wall. The inner pane never becomes cold enough to frost or mist. Instead of robbing the coal bin it imports so much warmth from the radiance of the sun on a bright day that the heating system must be checked.

Eventually, say some farseeing architects, even low-cost houses may be equipped with adaptations of this type of window.

Commercial and residential applications of 'case hardened' glass appear certain to expand rapidly. It will bend, twist and can resist hard knocks and wide temperature variation. It is a natural glass manufactured from ordinary polished plate and as there is no introduction of an organic interlayer there is no change in transparency or discoloration even with years of use or when the glass is subjected to severe changes of temperature.

Its toughness is illustrated by the window of a 'blitzed' British hospital which stood heavy bomb shock without splintering, even though sections of the metal case were blown off.

The glass in various thicknesses is already gaining use for windows, partitions, entrance doors and kitchen equipment. It is recognized as standard equipment by Canadian automobile manufacturers. Its protective qualities lie in the fact that on breakage it does not fly into splinters with razor-like edges, but disintegrates into small pieces which are neither large enough nor sharp enough to cause serious injury. This type of fracture occurs because of the stresses set up in the glass by the hardening process.

These, the new fibre, 'wool,' cloth, 'foam,' the new flexible and safety glasses, the new double-glazed picture windows and the rest, are just some of the new materials for postwar building from an industry which, though among the oldest, undoubtedly is among the most progressive and research-minded. **—Financial Post**

EDITOR'S NOTE: *This article on glass is merely a sample of the revolutionary developments that are changing our physical world. In every industry tremendous technological advancements are taking place. Because of these, North Americans are on the threshold of a new civilization.*

Canadian Telephone Industry

ACCORDING to figures recently released, the number of telephones in service in Canada continued to increase in 1943 reaching a new peak at 1,692,162. This was an increase during the year of 64,387 or 4%, and an increase during the past 10 years of 499,832 telephones or 42%. The largest gain during 1943 was in two-party lines, which increased by 32,421 or 7.4%. Private branch exchange and extension telephones increased by 13,638 or 4.4%, although residence extensions decreased by 1,294, or 2.6%; this was due to restriction and the tax on such extensions. Telephones on individual lines increased by 6.485 or 1.2%, on 4-party lines by 1,979 or 8.9% and telephones on rural lines (more than four to a line) increased by 9,026 or 3.4%. The other 838 of the increase were public pay telephones. The number of telephones on automatic switchboards (dial telephones) increased by 30,588 or 3.3% and on manual switchboards by 33,799 or 4.3%, each class retaining the same relative position to the total as in 1942.

The estimated number of conversation or completed calls included a count of 50,347,917 long distance calls and an estimate based on counts by large systems on representative days of 2,929,446,000 local calls, or a total of 2,979,793,917 calls. This was a slight reduction in the local calls from the 1942 and 1941 estimates but a new high record for long distance calls. The big increase here was in calls between Canada

and the United States and Alaska; trans-oceanic calls, except to and from Newfoundland, practically ceased, and calls to other western hemisphere countries were reduced also.

The revenue from long distance calls increased from $24,056,705 in 1942, and $15,636,249 in 1939 to $28,550,436 in 1943, whereas revenue from subscribers, renters, etc., increased from $56,310,788 in 1942 and $47,501,533 in 1939 to $58,786,854. Total revenues increased from $87,057,252 in 1942 to $94,406,757 or by 8.4%. The Federal excise tax on long distance calls increased from $2,269,070 in 1942 to $3,409,070 and on extension telephones the tax increased from $39,116 to $146,968. This latter tax was effective from June 24, 1942. Taxes paid by the telephone systems increased from $12,402,630 in 1942 to $15,286,611 or by 23%. There was an increase in the number of employees from 20,360 in 1942 to 20,694 or 1.6% but salaries and wages were increased from $31,580,290 to $33,581,699 or by 6.3%. The increase in pole line mileage was 744 miles or 0.3% and wire mileage increased by 43,284 miles or 0.7%.

The Bell Telephone Company, with head office in Montreal and operating in Quebec and Ontario, reported 956,113 telephones or 57% of all telephones in Canada and its subsidiaries account for another 4%. The provincial systems in the three Prairie Provinces accounted for 177,919 telephones, or 10.5% of the total. These provincial systems provide long distance service to the local systems and, except in Edmonton which operates a municipal system, they serve the large cities in these provinces. In the eastern provinces the provincial systems are mainly in the provincial parks for fire rangers, etc., and the Dominion systems are in outlying sections of the country where no commercial service is available.

—Agricultural and Industrial Progress in Canada

★ **THE NATIONAL INCOME reached a high level of $4,600 million in 1920, and fell off 24% in the following year. Recovery was continuous until 1929, when a maximum of $5,273 million was reached. The depression low point was 1933, when the national income was only 52% of the 1929 total. There was a temporary setback to recovery in 1938, and the subsequent advance has been greatly accelerated during the war years, with a total reached in the twelve months ended September (1944) of practically $9 billion.** —THE ROYAL BANK OF CANADA

Fuel For the Human Engine

Human food is just as much a fuel as is coal or gasoline or wood . . . The laws of thermodynamics are no respecters of persons, and they hold as fast and as rigorously in the case of the human body as they do in man-made engines. —TECHNOCRACY STUDY COURSE

MOST people look upon food as something more than a mere fuel, the intake of which keeps their mechanism going, but it is basically just that . . . . The supplying of food is the greatest business on earth, with more than two billion people eating about 6 billion meals every day. In fact man's first, most vital and largest activity is the growing, preservation and distribution of provisions for mankind. It is the function of the food industry to provide place, form and time utility. It must take the raw product, process it, preserve it, and deliver it to the market where and when it is needed, with all possible of its native flavour, nourishment value and good appearance.

We have come a long way since the walking ape-man played scavenger to the sabre-toothed tiger, and from the time, about 12,000 years ago, when Neolithic man learned to cook, to bring into domestication oxen, sheep and swine; to milk cattle, to cultivate wheat and barley and to make bread. We are quick to forget how recently many foods now classed as necessities have become available to us. Even 50 years ago the living standards that are commonplace in Canada today were utterly unknown. The food industry, by intelligent application of our natural resources, invested capital, mechanical power and inventive genius, has made it possible for every Canadian to have more of the products that contribute so much to our comfort and well-being.

A few glimpses from history might make the contrast more striking. In the reign of Charles II there was no means of preserving meat except in salt, and during several months every winter even the gentry tasted scarcely any fresh animal food. In the reign of Henry VII fresh meat was never eaten except during

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the short interval between midsummer and the end of September. Wheat bread was seldom seen in Charles' reign on the tables of even the middle classes, the great majority of the nation living almost entirely on rye, barley and oats. Macaulay records in his history that in the 17th century the holidaying gentry of Derbyshire repaired to Buxton, where they were crowded into low wooden sheds and were happy to live on oatcake and mutton.

The eight generations that have lived since the days of Charles II have seen great changes take place in diet and standards. Not only scientists, but the common people, know a great deal about nutrition, and business has kept pace by placing the needed foods at the people's disposal. We are able, today, to express in quantitative terms the nutritive requirements of individuals. We know the function and source of the vital vitamins. We know the consumption of calories in various types of work. There remain only education and distribution, to see that every citizen receives the energy-giving and health-protecting foods he requires.

This is not the place to discuss in detail the relative amounts of carbohydrate, fat, protein and mineral necessary for an adequate diet. In fact, so long as a diet gives enough calories there is no need to measure its individual constituents so far as sustenance is concerned.

There was a steady improvement in the supply and quality of Canadian diet up to 1944. From a prewar level below that of the United States in almost all foodstuffs, the general increase in Canadian consumption had brought supplies of nutrients to approximate equality with the United States, with the outstanding exception of ascorbic acid. The total food supplies entering into civilian consumption, distributed broadly in accordance with physiological needs, would be sufficient to meet nutritional intake requirements for health, morale and working efficiency.

A prewar United Kingdom survey disclosed upwards of thirty million persons subsisting on inadequate diets, and this total included twelve to twenty millions who had the money but were not getting the necessary nutritive value from the foodstuffs they bought. The question of nutrition, too, includes two major problems: how to put everyone

in the position to secure the minimum of foodstuffs necesary for subsistance, and how to make sure that people who can afford enough food are not malnourished through ignorance or carelessness.

A survey of nutritive intake in 5 regions of Canada disclosed that the difference in regard to calories, protein and iron were not great, but in respect of calcium the Quebec families had the smallest percentage of the estimated requirements, and those in the Maritimes showed a marked deficiency, while in the other provinces the consumption in urban wage earners families appeared to supply nearly the full requirement as specified in the Canadian dietary standard. The report showed that within the family the worst fed member is the mother, the best fed the father or chief wage earner and the younger generally fared better than the older children. Differences between British and French families are small. The French group consumes slightly more bread and slightly less milk and fewer eggs, more potatoes but less fresh vegetables and fruits, and slightly more pork and less sugar.

Inadequate and unbalanced diets are the sole cause of certain diseases, and important factors in lowering resistance to illness generally. A lot of nonsense has been written about vitamins, but nothing can detract from their importance in the human diet. Deprived of vitamins, the body functions badly or not at all in utilizing the other food elements. It has been found that the number of calories can be reduced drastically without permanent harmful effects, if the supply of vitamins and minerals is maintained at an adequate level. On the other hand, if calories were maintained and vitamins drastically reduced, the victim might die with a full stomach.

Persons interested in a detailed discussion of the part vitamins play in human well-being can find it interestingly set forth in **Vitamins and Health,** by Borsook and Huse, while the Canadian situation is well covered in the report of the Combined Food Board Committee published in Canada by the King's Printer under the title: **Food Consumption Levels in Canada, the United Kingdom and the United States.** There is space here for only a brief mention of the most important vitamins. An adult needs 5,000 In-

ternational Units of vitamin A daily, and this may be had in whole milk (220 to 300 units to the glass); cheese (900 units to the ounce); butter (600 units to the tablespoonful) and eggs (500 units each). Vitamin B has been called the modern scientific substitute for the sulphur and molasses, bitters and tonics of the last generation, with the difference that vitamin B is effective, when used intelligently. B is not one vitamin, but many, hence the term 'Vitamin B Complex.' Of B1 a moderately active man requires 600 units daily, and a woman 500; of B 2 the requirements are 3 milligrams and 2 milligrams daily. Vitamin C, the anti-scurvy vitamin, is needed in the amount of 800 to 2000 International Units. Canadian supplies of vitamin C in food exceed the average restricted intake requirements, and are appreciably below the average recommended full intake requirements, while both the United States and the United Kingdom supplies show a substantial excess. Principal among common sources of vitamin C are oranges, lemons and grapefruit, while tomato juice has about one-third to one-half the vitamin C content of the citrus juices. Potatoes have been, for a century and a half, the leading source of vitamin C for many people, especially when cooked in their skins, and were recognized as an anti-scurvy protection long before the real cause of the disease had been discovered by science. Vitamin D, of which a deficiency causes rickets, is peculiar among the vitamins because it is created as a result of the sunshine falling on the skin.

So far as the general supply of foods entering into civilian consumption in Canada throughout the war period is concerned, the significant fact is that there has been a substantial increase over the prewar 5 years. In 1944 the following were representative percentage increases over prewar: milk and milk products 20; meats 32; poultry, game and fish 6; eggs 21; oils and fats 4; tomatoes and citrus fruits 53. On the other hand, there had been a decrease in consumption of some foods, by the following percentages: sugars and syrups 11; tea, coffee and cocoa 2. It is interesting to note that the United Kingdom increased its use of milk and milk products 26%, potatoes 61%, vegetables 47%, grain products 17% and eggs 2%, while it de-

creased in every other food classification by amounts ranging from 30% for tomatoes and citrus fruits to 16% for fats. The United States increased consumption in all but 3 classifications.

Spendable income of Canadians last year was about $3 billions higher than in 1939, and as other commodities became scarcer, Canadians spent more than ever on food. Up to November, wholesalers had sold 12% more groceries by dollar value and 10% more fruits and vegetables than in the same period in 1943. The food cost of living index has fluctuated as follows: 1929—134.7; 1939—100.6; 1944—131.3.

Giving credit where credit is due, the farmers of Canada deserve praise for the splendid way in which they have produced food in such great quantity in spite of shortage of help and dearth of machinery. This fine effort has made it possible to meet the increased demands of civilians for meat, vegetables and dairy products, while keeping up a high level of exports to the United Kingdom and other United Nations.

Meat production, on the increase since war broke out, reached new heights in 1944, when slaughterings of hogs and beef cattle were the largest in history. Meats and poultry, excellent sources of high grade proteins and certain vitamins of the B group, are all important in the nation's diet, and it was a relief to health authorities as well as to consumers when the rationing was suspended a year ago. The great volume of livestock placed considerable stress on handling facilities, and packing plants were strained to the utmost while transportation, cold storage, stock yards and other agencies were utilized to capacity. Beef is expected to remain in abundant supply this year, but reduction of the number of hogs on farms may mean a somewhat less plentiful quantity of pork products. Domestic supplies of mutton and lamb may be lower, as a result of the opening up of export of sheep and lambs to the United States.

Milk in any form is an economical source of proteins of high quality, calcium and riboflavin, as well as of other vitamin and mineral elements. It is the most complete single food. It seems as if 1945 will see demand again in excess of supplies, but much depends upon the pasturage conditions of summer. Most recent

figures show the percentage utilization of Canada's milk supply as follows: fluid 35; butter 48; cheese 11; evaporated 2; ice cream 2; other 1. The civilian demand for fluid milk has increased steadily until it is now 17% above the prewar level. Cream sales were, of course, frozen at the June 1944 level. Butter production decreased 5% last year, and stocks continue to give concern to the authorities. The bulk of sales go to consumers who get 80% of the quantity available for distribution. Dried whole milk is an important product, the principal civilian use of which is in the food industries, though about half the total production is reserved for priority uses such as Red Cross prisoner of war parcels. Each parcel contains one pound of dried milk powder, and parcels are being shipped at the rate of 140,000 weekly. Another priority use is for the armed forces in remote areas where fresh milk is not obtainable. Civilian consumption of evaporated milk has increased greatly, so that prior to imposition of restrictions of sale in places where fluid milk could be obtained, the supply was inadequate in needy areas. Cheese production was maintained in 1944 at a level sufficiently high to take care of the 125 million pound British contract, and to provide a slightly greater amount for civilian use. It is expected that the quantity available for use in Canada this year will be about the same.

The supply of leafy, green and yellow vegetables, so important for their vitamin C and pro-vitamin A content, is a problem in a country like Canada, because of the short growing season and the high cost of imports. Supplies of leafy vegetables per capita in the United Kingdom in 1944 exceeded the United States supplies by 44% and the Canadian estimate by 124%, private production in the United Kingdom having risen by 15 pounds per capita, largely as a result of the 'dig for victory' garden campaign. These figures are supplied by a special joint committee of the Combined Food Board.

Grain products are important in the food picture as inexpensive sources of energy and protein, and they also supply iron and certain vitamins of the B group. Canadian flour millers are operating at the maximum level allowed by the available

worker supply, at just below theoretical full capacity. This is one of Canada's oldest industries, dating from 1607, when the first mill was built in Port Royal, now Annapolis, Nova Scotia. From that beginning, the industry has grown until, in the 1943-44 crop year, Canadian flour mills processed 110 million bushels of wheat. The present war has witnessed a revival of flour export, attaining a record in the 1943-44 crop year of 13.5 million barrels. Exports absorb from a third to a half of total production, and are highly important, therefore, to the welfare of the industry.

Bakeries, too, have been operating at or near capacity, the only limiting factor being the shortage of labour. There is an increased per capita consumption of bakery products due to the sugar rationing, the number of women working and the greater availability of ready cash.

Sugar and other sweet products such as syrups, molasses, honey and preserves are of importance in supplying food energy and in adding flavour. When first known to the world, sugar was used as a medicine, then it became a luxury, and now it is a necessity of everyday life. In the war with Napoleon, when the British blockaded the French ports, they cut off the supply of cane sugar. This drove the French to develop the beet industry, and at the close of the nineteenth century the world's output of beet sugar exceeded that of cane sugar; today about one-third of the total output is from beets. In Canada in 1943 beets provided 15% of sugar production. Development in sugar beet production has had an impetus since the war started, and this industry is expanding in northern countries, close to densely-populated markets. Russia has developed a method of concentrating beet juice into solid blocks at the scene of the harvest to reduce transportation costs. The demand for sugar in Canada is in excess of the supply, refiners having been forced to operate on a curtailed basis due to difficulty in getting raw materials.

Fats and oils provide the most concentrated sources of food energy, besides having great importance in cooking, as spreads for bread, and for adding flavour. They are particularly important to heavy workers, because they reduce bulk and thus enable the workers to absorb their high

calorie need. Supplies available to Canadian civilians are not likely to be higher in 1945 than in 1944, and continued economy in their use is needed.

Fish has never been a big item in Canadian diet, and supplies for the domestic market are expected to be equal to the demand, though variety may be limited. Most of the salmon pack will again go to Britain, but **Consumer Facts,** published by the Wartime Information Board, expresses the opinion that a small amount will be available for civilians. The contribution of the fish industry to the United Nations food supply is important, with current agreements calling for delivery of 140 million pounds of canned salmon, and 1¼ million pounds of sardines.

The domestic supply picture in regard to eggs is very good, while exports to Britain of shell eggs should increase. It is expected that in this year some 1½ million cases will be sent, equal to one extra fresh egg a month per capita.

Supplies of poultry are abundant in Canada, in addition to exports to the United States and over 2 million pounds dressed poultry shipped to Britain last year.

A good word must be said about the food manufacturers and distributors, who have overcome wartime difficulties, kept up the standards of their goods and made them available where needed. It has been a tremendous task. Food manufacturing is a big industry, with 8,500 establishments employing 115,000 persons, to whom it paid, in the latest year recorded, $128 million in salaries and wages. The capital invested is $550 million, and the gross value of the products in the year was over $1.1 billion. Figures given at a McGill University lecture indicated that food processing represents 34% of manufacturing establishments in Canada, 12½ cents of every dollar invested in manufactories, better than 15% of employees, and 22.6 cents of every dollar of manufacture.

The demand for canned goods of all kinds remains high, and easing of the tin situation will help the industry to meet the rising requirements of housewives for quickly prepared foods. Seasons are not so important now as formerly in relation to food. Fruit and vegetables are available at all times of the year, re-

taining much of their flavour and attractive appearance, as well as their dietary usefulness. Canada's canning factories, which produce at the rate of about $30 million a year, compared with $14 million at the close of the last war, are in excellent condition. They are kept spotlessly clean, and high hygienic standards are demanded of employees. Everything entering into manufacture must be sound, wholesome and fit for human food.

Canada was the first country in the world to have special legislation for canned foods, and at the same time it was required that all packages must be marked with a true and correct description of the contents. This is a safeguard to the consumer and to the conscientious merchandizer. Grading saves time for the consumer by enabling him to buy exactly what he wants, and no more. It saves money, because there is less waste. It provides a standard by which goods may be bought at long distance, without personal inspection.

Standards are particularly important in export trade, where purchasers must be assured of the exact type of commodity they are to receive. Surplus food-producing countries are preparing for an expansion of their export activities, and, as has been pointed out in previous articles in this series Canada must be to the forefront in seeking to dispose of her food produce. This is not something to be taken casually; it is a problem that cannot be brushed off, or laid aside for future consideration. It is a problem that will face Canada squarely now that the German war has ended. According to the Economic Annalist of the Dominion Department of Agriculture, Great Britain plans to maintain a high level of production; Russia looks forward to new crop acreages aggregating several million acres yearly; China envisages a 14% increase in plant products and much more in livestock; India is figuring on raising agricultural production by 100% in 15 years. All of this means that in regard to disposal of its food production Canada needs agressive thinking and dynamic action.

In spite of the amount of food Canada produces (and she exports around $440 million worth annually) it is necessary for her to import edibles worth about $100 million. This amount includes fruits, nuts, vegetables,

grains, vegetable oils, cocoa, coffee, spices, tea, fishery products and meats, commodities which cannot be grown in Canada, because of climatic conditions or because of economic factors. Take tea as an example. It cannot be produced in Canada, yet Canada is predominantly a tea-drinking country, with an annual consumption normally averaging about 3½ pounds, or 700 cups per capita, an amount exceeded only by Great Britain, Australia and New Zealand. The Empire Tea Bureau reports that 95% of Canada's peace-time consumption is of black tea, mostly from India and Ceylon. Today, of course, with green tea from Japan cut off, imports are 100% empire black tea. The average purchase of Canadian families is more than 15 pounds per year, and 93% of Canadian families are regular tea buyers. A poll taken during the darkest days of rationing revealed that more people missed tea than any other food item except sugar. A peculiar feature is seen in the breakdown of the income classes: while 83% of families in the highest income brackets buy tea, the percentage increases steadily to 94% for the lowest income class. Tea is imported into Canada to the extent of about $20 million a year, equal to 8 billion cups, because Canadians find it economical and satisfying, and it is a 'must' on our import list.

Canadians have lived exceedingly well during the past few years, and they will not wish to abandon these gains. Indeed, one of the great endeavours of health authorities on all levels of government should be to maintain and extend the gains that have been made.

★ THE SWIFTLY PACED DEVELOPMENTS of the war have accelerated technological progress not only in industry but also in agriculture, where results have been equally dramatic if less publicized. Advances have been registered in several important lines; in the processing, preservation and packaging of foods; in the cultivation of larger yielding strains and varieties of crops. New methods of disease and insect control are available, and new machines and labor saving devices have been perfected. Better fertilizers and improvements in livestock breeding and feeding are noted. Increased interest in nutrition has also improved national standards of living. —THE INDEX

Notes on Organization

The statesmanship of the New America exists today, not in the debt merchant or the politician or the gangster, but in that personnel which daily in every walk of life is designing, constructing, and operating the physical equipment of this Continent.

THOSE readers of this report who are members of Technocracy will know that the organization and operation of the Sections has been a process which has been studied and improved with each passing month. Further improvements will undoubtedly be made, but for the present it is a satisfaction to note the issuance by Technocracy of a pamphlet containing the revised and enlarged **By-Laws and General Regulations.** These will prove a great aid to the Section membership in building up a competent organization and, furthermore, will answer or explain many of the minor questions which heretofor have been addressed to Continental Headquarters.

The statesmanship of the New America exists today across this broad land of ours in the personnel, not of the debt merchant or the politician or the gangster, but in that personnel which daily in every walk of life is designing, constructing, and operating the physical equipment of this Continent.

The foremost specification in the statemanship of the New America is a knowledge of precision control of all energy-consuming devices. Under the hazardous interference political control of this Price System, technology—drafted into service by the system for the further reduction of physical costs—has developed a methodology of control which is the most sensitive and accurate ever devised by man. It is in use today in every high-tension transmission system and in every high-speed, continuous straight-line production system.

It is the only system that can be extended to give a balanced-load control of all Continental operations. It is the only system that has as its inherent, impersonal objective the satisfaction of the wants of man. It cannot be operated by morons, nor by an undisciplined, unorganized mob, nor by sincere self-seekers wishing to do someone else good for their own betterment.

The balanced-load system of Continental control cannot be bribed or gypped, and personal favoritism doesn't count in its operation: being somebody's son or brother-in-law won't get you anywhere. Personal influence under this

system will be of no use except as an amusing pastime. The success of the individual under such a Continental system will not be gauged by his bank account, his bonds, or the pleasing personality of his Arrow-collar appearance, or his nicety in rendering Emily Post amenities. The success of the individual will be determined solely by his capacity for competent functioning in phase with the balanced-load operation.

Discipline may be defined as that conditioning of an organism, whether consciously or unknowingly acquired, which is prerequisite to any form of behavior other than the simple responses set off by innate instincts. Some degree of discipline is therefore essential to the carrying out of virtually any conceivable human objective.

The unique character of America's present and most probable future physical state has laid down the specifications for social operations which will have to be adopted when the Price System shall have become inoperable. It has been shown that the design of the Organization known as Technocracy Inc. is in turn laid down by the advance requirements of those operating specifications. The problem of applying science to the problems of human society is here undertaken as 'a culmination of the unidirectional progression of all the divisions of science'—physics, chemistry, biophysics, geophysics, astro-physics, electro-mechanics, etc.—'into the science of social phenomena.' Technocracy may correctly be called Social Engineering. Similarly it has been shown that the character of the job in hand specifies certain requirements of conditioning on the part of all individuals preparing to carry it out, over and above that great range of useful abilities that members by and large already possess.

From this it follows that Technocratic discipline consists of acquiring certain functional capacities. These are, briefly, a degree of proficiency in applying a scientific procedure, in conjunction with appropriate available scientific knowledge, in the solution of problems encountered; the capacity to carry out the work of any one or more of the functions of the Organization as outlined in *By-Laws and General Regulations;* and the capacity to function 'in phase' with the functioning of the Organization as a whole—that capacity which is acquired through understanding of the Organization's operating characteristics as well as one's own, as they are found to exist, whether considered as a whole or in detail.

In the Introduction to the Technocracy *Study Course* certain 'tools of the mind' are provided and the correct use of language of scientific procedure is indicated. Knowledge is received, recorded, and conveyed only by means of defined terms; and then only in the form of verifiable facts.

A clear idea of the extent to which language is commonly misused may be obtained from Hayakawa's book *Language in Action* (Harcourt Brace & Co.). Many potentially useful words have been rendered, by constant popular misuse, practically useless for any scientific purpose. For example, words like 'dictator,' 'freedom,' 'justice,' 'regimentation' have acquired, through reckless or unscrupulous use, connotations

so loaded with emotional prejudice that they are almost useless for any purpose except starting an uproar. It is here warned that the word 'discipline' itself is so often misused that it tends to suggest ridiculous notions of an ironpants authoritarianism or of grisly punishment.

As the scientific method cannot afford to confuse issues with idle argument, so Technocracy does not and by nature cannot indulge in arbitration by personal authority. Decisions arrive from examination of the facts. Such a discipline obviously cannot be enforced by penalty, and in Technocracy 'punitive' discipline does not exist. All Technocrats, however, learn to take orders as well as to give them.

Technocratic discipline, then, is essentially self-discipline. The problem is quite simple; but it should not be inferred from this that such self-imposed discipline is in practice quite easy. Such a conclusion would be merely another misuse of words, for it can be quite difficult.

The *Study Course* itself is a collection of facts, arranged in an orderly manner, and summarized in a scientific manner as laws or tendencies, or projected as statements of probability. Examination of the course should proceed in a spirit of analytical, critical inquiry—a spirit which may be kept alive by constant challenge with the question: 'What has this fact, or series of facts, to do with North America's social problem?' The social significance of the facts is thereby highlighted, and the significant relationships with other facts easily seen—with practice. As this critical approach becomes by constant use a habit of mind, it will be extended to the student's inquiries into wider fields—the scientific source-books of the Technocracy *Study Course* will be scrutinized carefully and other books, magazines, and newspapers will be analyzed objectively.

Technocracy's findings are presented to the public as known and verifiable facts. In accordance with such a scientific procedure, emotionalization is not indulged in. The situation as it develops provides a grim show—one can rave insanely to Heaven about it, but there is no future in that!

The antics of the prominent supporters of any and all the institutions of scarcity in the face of North America's great emergent need are indeed contemptible; but if the ironic character of the situation is understood, it may be viewed as high comedy. Since we are paying the price, we may as well have the fun! Too, the ironic wisecrack has long been used as a very effective weapon. It produces somewhat the effect of the impact of a snowball upon a shiny silk hat. In this twentieth century does any wearer of a high silk hat deserve to look anything other than ludicrous? Much of our social big-shotitis, our stuffed-shirtism, our idolization of the enterprising individual, is, to use the figure, an idolatry of a spiritual silk hat.

From the outset the fact must be faced that our previous conditioning has been, virtually from the cradle, a subjection to the malpractices, the frustrations, the wishful concepts, the 'vicious virtues,' the noises and the stenches, the over-prevalent sexual disharmonies and their resultant emotional disorders, the insecurity, the dead foods ill-prepared and

'made to sell,' the fears and resentments, and their emotional compensations, the superstitions, and the physical privations of this Price System. Whether known or unrecognized, whether approved or condemned, whether idolatrized as ultimate good or anathematized as evil, these factors constitute the disciplines of scarcity. Philip Wylie in his book *Generation of Vipers* (Farrar & Rinehart) lists many types of resulting twists in human behavior rather dramatically, but seems to be only partly aware of the causes and correspondingly vague about the cure: he refers to them as spiritual faults and moral wants, but this is a moralizer's classification of symptoms and not a scientific diagnosis.

Minor emotional aberrations and tantrums are of such common occurrence that they are usually accepted as healthy human behavior, and pass unnoticed. Macpherson Lawrie in his book *Nature Hits Back* (Methuen) states that recognized cases of insanity receive treatment, inadequate though that treatment may be, out of all proportion to the ratio of their collective suffering in the vast sum total of human misery resulting from mental disorder. The great problem is the man on the street and his 'human' incompetence arising from emotional stresses that are unrecognized, usually unseen. Nevertheless the vague fear or anxiety, the unexplained feeling of depression or despondency, the lethargy and fatigue and ennui, of the man or woman in the street, are the mild neurasthenia, the undeveloped prototypes of the plainly recognized insanities of agitation, panic, and desperation without tangible cause, the melancholia, or the helpless stupor. The fact must be faced that 'the insane are a lot like the rest of us, only more so!' If the social factors that produce continuous emotional strain continue to operate, as in the past, with ever-increasing intensity, they are quite capable of wrecking our nations without any help from future economic or military developments.

The educational processes of this Price System are based upon the revered disciplinary practices of compulsion, pretension, intimidation, and prohibition. The punishment fits the crime—so well in fact, that the result is normally an enhancement of the emotional sickness or material want which produced the crime.

The first generation of New Americans will exhibit behavior patterns profoundly different: their conditioning will be carried out as one of the elements of 'a clean, hard, bright design for living that will be the glory of all the ages.' It is indeed questionable whether or not we shall be able to understand much about these children of ours. Their conditioning would be admirably adapted to the carrying out of the task we now undertake—but let us admit that ours is no better than it should be!

Let us realize that to function 'in phase,' to maintain a spirit of cheerful endeavor in the face of frequent cause for discouragement, to get along with people and to tolerate the personal peculiarities of other victims of Price System conditions even as our own are also tolerated, to resolutely refer all questions to the facts involved and to the requirements of the job, to refrain from the prevalent maloderous habits of indulging

in opinions, personalities, gossip, loose criticism, and argument, is unlikely to be easy at the outset. But it will come with constant practice.

When these malodorous habits are indulged, the indulgence constitutes sabotage. If the effects upon the carrying out of Technocracy's job are serious, it must be accepted as final evidence that the victim of the habits is thereby rendered unfit to be a Technocrat.

It should be stated that the possession of a college degree has often hindered the possessor's progress in understanding Technocracy as much as it has helped it. College passmen are steeped in the enervating philosophical atmosphere of intellectual liberalism. To make a flat decision—even to know anything for sure—is considered crude, coarse, and crass. It is an attitude of mind which surmises that everything is for the best somehow—that the enunciation of a few new philosophical principles by 'thinkers' from time to time is enough to guide man's faltering footsteps up the long path to Utopia. 'Intellectual liberals have acquired so much erudition that they are only capable of endless deliberation. All they can do is decide not to decide.' A background of business success often produces a similar effect.

Technocracy's discipline cannot be obtained in any college or university. It cannot be bought with money, even though Technocracy's activities, like any worthwhile pursuit, do cost money as well as time. Technocracy has no subsidies or endowments; it has been built by its members with their own resources. Technocracy has accomplished far more per dollar of investment than any other organization of human beings past or present. Members have openly stated that the personal development they achieved in Technocracy has been worth many times the cost, even if they never live to see the New America. They should know because their investment of time and money has been above average. This is an education that does not require a college degree or even a high school diploma as prerequisite—it requires only plain citizens of the national entities of North America who are possessed of clean patriotism, loyalty, personal integrity, and a modicum of sense.

The war and the immediate postwar period are inextricably locked together, and Total Conscription is the way to win the war sooner and to preserve internal stability after the war by a system of control that is not in conflict with our technological progress. Then let the people of this Continent decide which way they want to go. Let all Technocrats study the clauses of Total Conscription in the light of the attempts being made by business to revert to the prewar economy. Investigate and use the facts which are published on government-owned plants, new equipment, new capacity, and corporate profits to illustrate the necessity of Total Conscription.

A Question Answered

WHAT is the attitude of Technocracy Inc. toward religion?

Technocracy Inc. is concerned with the transition to the social operation that science has indicated as the next most probable for the people of North America —if most of them are to go on living. As an Organization, therefore, it will never allow itself to be dragged into religious controversy of any kind. It regards the religious beliefs of an individual as sacred to that individual.

In the Organization are persons of every religious denomination working for common objectives —economic security, a higher standard of living, and greater leisure; in effect, for the social mechanism that has been made possible and imperative by the advance of technology.

In the Technate every person will have the opportunity to really be a Christian. No longer will anyone have to chisel other human beings in order to obtain a livelihood.

This applies to ministers and priests as well. No longer will they be forced to chisel their congregations for a living. Should any sufficient number of people request the services of some individual as their spiritual adviser, he will be released from work in any other Functional Sequence and can devote his time to religious teaching as a member of the Social Service Function, while at the same time receiving a consuming power equal to that of anyone else.

Many religious leaders of today see in Technocracy the answer to all that they have worked, hoped, and prayed for — a life of security, abundance, leisure, and peace for mankind; a society practically free from disease, crime, and ignorance.

★ CANADA'S NET DEBT today is nearly three times the prewar figure. In 1913 the net debt per capita was $41; in 1919, $199; in 1939, $279; and in March this year (1944), $774. Annual interest charge on the funded debt at the end of the last fiscal year was $274 million, or an average rate of 2.57%, compared with 3.52% in 1939 and 5% in 1919. --THE ROYAL BANK OF CANADA

TECHNOCRACY

WHAT?

Technocracy is science in the social field. **Encyclopedia Americana** says: 'Whatever the future of Technocracy, one must fairly say that it is the only program of social and economic reconstruction which is in complete intellectual and technical accord with the age in which we live.'

WHEN?

Technocracy originated in the winter of 1918-1919 when Howard Scott formed a group of scientists, engineers, and economists that became known in 1920 as the Technical Alliance—a research organization. Some of the better known names in the Technical Alliance are of interest, such as: Frederick L. Ackerman, architect; L. K. Comstock, electrical engineer; Stuart Chase, C.P.A. (now well-known writer); Bassett Jones, electrical engineer; Leland Olds, statistician (now Federal Power Commissioner); Benton Mackaye (now in the Forestry Department); Charles P. Steinmetz and Thorstein Veblen (both now dead). Howard Scott was Chief Engineer. In 1930 the group was first known as Technocracy. In 1933 it was incorporated under the laws of the state of New York as a non-profit, non-political, non-sectarian membership organization. In 1934 Howard Scott, Director-in-Chief, made his first Continental lecture tour which laid the foundations of the present Continental membership organization. Since 1934 Technocracy has grown steadily without any spectacular spurts, revivals, collapses, or rebirths. This is in spite of the fact that the press has generally 'held the lid' on Technocracy, until early in 1942 when it made the tremendous 'discovery' that Technocracy had been reborn suddenly, full-fledged with all its members, headquarters, etc., in full swing!

WHY?

Technocracy's survey of the economic situation in North America leads to the conclusion that there is in development a process of progressive social instability, that this process will continue until the instability reaches the limits of social tolerance and that there then will have to be installed on this Continent a social mechanism competent to meet the needs of its people. Technocracy finds further that the day when social operations on this Continent can be based on a method of valuation has passed, and that it is now necessary that there be applied in the social field the quantitative methods of physical science. Technocracy, therefore, proposes that the North American Continent be operated as a self-contained functional unit under technological control. This control would operate the area under a balanced-load system of production and distribution, whereunder there would be distributed purchasing power commensurate with the resources and the continuous full-load operation of the physical equipment, with the guarantee of a high standard of living, equality of income, and economic security, at a minimum of working hours, to every adult inhabitant.

HOW?

At this stage the objectives of Technocracy are first, the education of the people of North America to a realization of the conditions behind the social crisis, and second, the organization of all those willing to investigate and interest themselves into an informed, disciplined, and functionally capable body whose knowledge and ability can be called upon to prevent chaos in North America at that time, now imminent, when the Price System can no longer be made to operate.

The Strangers

IT happened in France the other day. One of the bitterest ironies of our age of war . . . An American soldier—whose father had died in Flanders' fields without ever having seen his infant son—gave his life for the future of an infant son he in turn had never seen.

Three generations of strangers . . . and now what of the third generation? Will this child, too, grow up to inherit all the old lies, the mistakes, the weaknesses that go to make up war?

What is it that his father and his father's father died for?

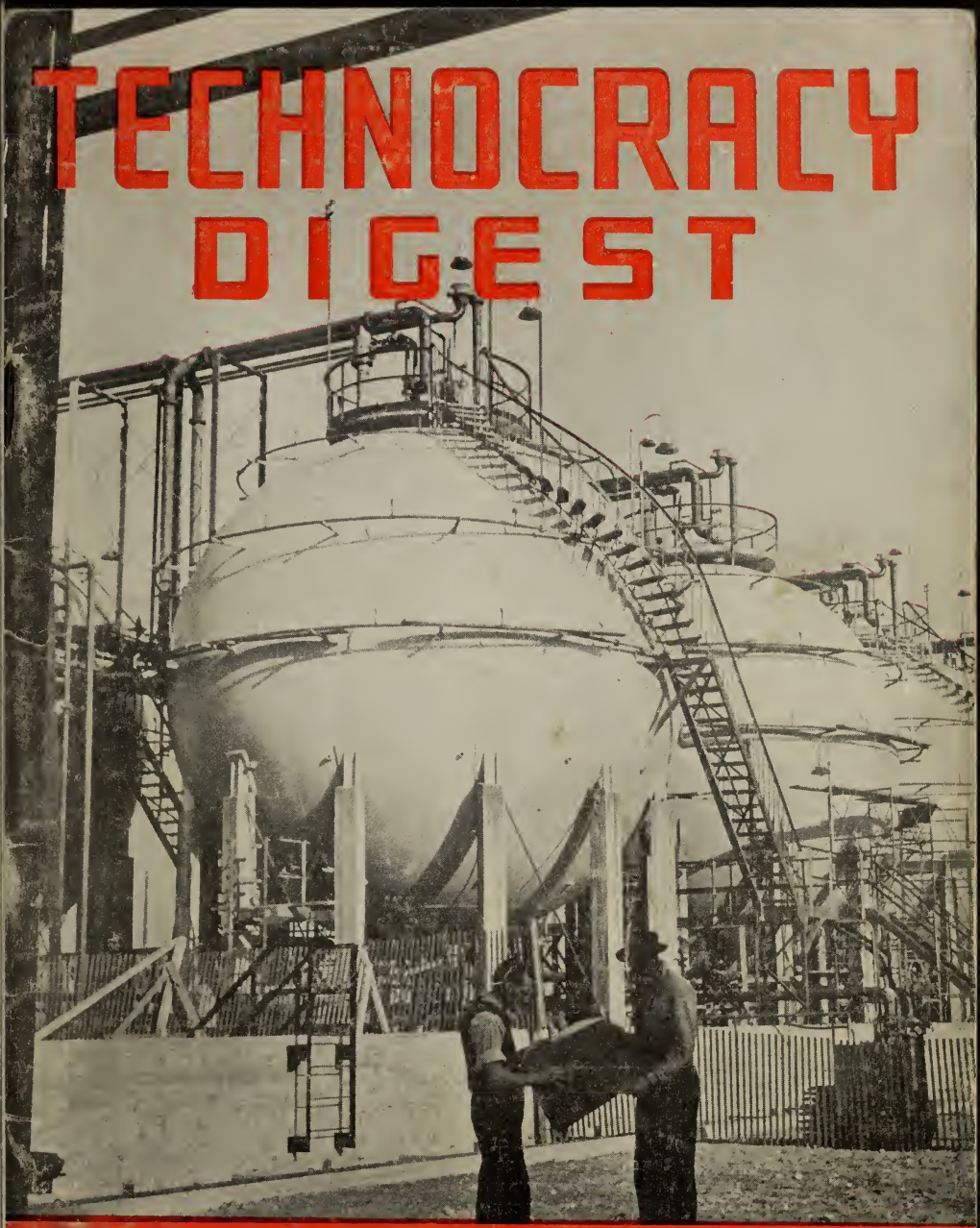
Already, we're dusting off the solemn aphorisms about not having died in vain, and we'll build a bright new marble cenotaph to his unknown father. But it isn't enough. Brother, it isn't enough!

We will emerge from this war the most powerful nation on earth. Our Navy and our Air Forces will be twice the size of all others combined—our manufacturing productivity will equal half the world's total capacity. If we can't enforce peace with that kind of club—and if we can't make jobs building houses for our sons to live in as well as by building tanks for them to die in—then God help us!

—Bryant Chucking Grinder Company Advertisement

(Section Stamp)

TECHNOCRACY DIGEST



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TECHNOCRACY DIGEST

THE ONLY MAGAZINE IN CANADA THAT IS PREPARING THE PEOPLE OF THIS COUNTRY FOR SOCIAL CHANGE

AUGUST, 1945 VANCOUVER, B.C. No. 86

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FRONT COVER

The Polymer synthetic rubber plant at Sarnia, Ontario, produces buna-S at an annual rate of 34,000 long tons and butyl at the rate of 4,000 long tons. This is the only plant in the world which not only makes these two kinds of rubber but also makes the three necessary ingredients, styrene, butadiene, and isobutylene.

(NATIONAL FILM BOARD PHOTO)

North Americans Must Face the Facts

Technocracy points out that only World War II has made it possible for the Price System to survive until now. With World War II coming to an end, we must prepare to meet the greatest social crisis that North America has ever known.

THIRTEEN years ago—in the fall of 1932—the word 'Technocracy' burst upon a depression-stricken world. For a few short months the newspapers and magazines of North America ballyhooed Technocracy as 'the greatest story since the (first) World War.'

Then, just as abruptly, Technocracy was dropped. Some of its social implications had been realized—so its findings were ridiculed and the press henceforth maintained a conspiracy of silence against it.

Technocracy went quietly and steadily about its work, secure in the knowledge that events would finally force North Americans to face the facts. Today, ironically, the one-time ridiculers of Technocracy are 'stealing our stuff.'

Technocrats, who through the years have kept at their task of educating the people of this Continent to the social consequences of technology, can now feel satisfaction to see such a sacrosanct status quo-er as the **Wall Street Journal** printing material that reads like notes from a Technocrat's case book:

'The number of machines on farms has increased 50 per cent since the beginning of 1942. These machines more than halve the man-hours needed for this work. Such greatly increased mechanization helps to explain how agricultural production has increased 20 per cent since 1939 despite a sharp decline in farm employment.'

'. . . in Colonial times 90 out of every 100 people in this country had to work on farms to grow enough food. Now the ratio is just reversed.'

'A century ago one man could take care of about five acres of corn; now he can handle a hundred acres. In 1909, it required 12.7 man-hours to grow an acre of wheat; by 1935 this had been halved, and today it's down to 3.3 man-hours.'

'. . . the number of corn pickers

in use has increased 29 per cent during the past three years. One man can harvest as much corn with one of these machines as 10 or 12 can by hand.'

'New machines . . . may revolutionize cotton production. A mechanical cotton picker is now in limited production by International Harvester. It picks in a day about as much cotton as could be harvested by 40 to 50 average hand pickers.'

Remember that Technocracy told you such things back in 1932. Today, Technocracy points out that only World War II has made it possible for the Price System to survive until now. With World War II coming to an end, we must prepare to meet the greatest social crisis that North America has ever known.

—The Editor

Our Technological Tomorrow

★ WHEN THE WAR ENDS in Europe the agricultural plant of the United States will be geared to produce approximately one-third more than the average production of the pre-war years and with more land, labor, machinery and technology available, the industry's productivity could probably be expanded to at least 50% over the peacetime output within a short term of years, the Department of Agriculture estimates.

Obviously farmers will want to continue producing at high levels. Doubtless they will wish to avoid any return to crop-restriction programs. But many stubborn facts lie in the path of the attainment of such ambitions. Large stockpiles of surplus food exist today. We cannot count on the kind of food export boom such as that which developed after World War I when foodstuffs, in the year 1919, for example, constituted about one-third of our total exports. Military food procurements, now running at the rate of 8 million tons a year would be cut in half when hostilities end in Europe, it is estimated, and our civilian reserves of 5.5 millions tons in England would probably follow a similar contraction. —The Index

★ A ROTOLACTOR, or cow-milking machine, the first one of which has been in operation in New Jersey since 1930, is soon to be marketed in two sizes, one having twice the capacity of the other. The smaller one which will cost approximately $50,000 and requires two attendants, milks 25 cows at one time, the whole process taking less than 12 minutes. With this machine, therefore, a herd of 800 can be milked in six and a half hours.

★ NOW IS THE TIME to do some serious thinking about the effect of modern technology on postwar reconstruction. Unless attention is given now to the probable consequences of technological advance, speeded up by the war, we will find ourselves (as usual) sadly debating what should have been done when there was still time to do it, and resorting to wholly inadequate makeshifts. —Joseph Mindel in *Tomorrow*

The Electron Wants Your Job!

The electron is your rival in postwar industry—and he's no imaginative bogey. He's here. He may even be doing your prewar job, and doing it with an accuracy and speed that puts your performance to shame.

MISTER, you really don't amount to much. You now have a rival who can do almost everything better than you can.

Your rival is the electron, who has been harnessed to do better work than you ever did, in a thousand different fields. And he does it more quickly and cheaply. The mechanical man has fingers that feel, eyes that see, a nose that smells, ears that hear, and a brain that in certain respects can outthink you every time.

He's your rival in postwar industry—and he's no imaginative bogey. He's here. He may even be doing your prewar job, and doing it with an accuracy and speed that puts your performance to shame. He's so successful that the industry which makes and installs the mechanical men—electronics — has mushroomed during the war into a six-billion-dollar business. No other industry with peacetime potentialities has experienced such a growth.

The invention of the mechanical man has not yet been felt by the average worker because of the demands of total war production. But in the coming months, we are certain to see the mechanical man invade civilian and consumer industry. Wartime research has already revealed ways in which electronics can take over jobs in almost every field.

For the present, we can only guess what effect this will have on employment. Before we go into this problem, let's consider what electronics is, and what it is doing now.

Electronics is the science that harnesses the electron, a particle so small that it compares to the head of a pin as a bumble bee does to the Empire State building. The electron is harnessed by means of either vacuum or gas-filled tubes. There are five main kinds of these electronic tubes: (1) the radio tube; (2) the photo-

Reprinted from MAGAZINE DIGEST.

tube, or 'electric eye'; (3) the X-ray tube; (4) the television tube; and (5) a group of gas-filled tubes known as thyratrons and ignitrons. These last can conduct large amounts of power, and are able to change alternating current into direct current.

These five main groups come in some 2,000 different shapes and models, each for a different job. One of the simplest applications of electronics is the 'electric eye' which opens a store door automatically at the approach of a customer, turns on a drinking fountain, or sets off a warning signal when a burglar breaks an invisible beam of light by trying to enter a building through an open window.

Other uses for electronics range from automatic assembly-line inspection of the contents inside sealed cans and cartons to calculating the pattern of human brain waves for use in diagnosis.

In industry, electrons have taken on such jobs as fashioning the huge 24 foot diameter propellers for battleships, aircraft carriers, troop transports, and cargo ships. Formerly these big propellers had to be fashioned by hand—a job that took two weeks. Now, with electronics, a propeller is made in two days—a 700% saving in time. Electrons control a tracer that automatically guides two sharp steel-cutting tools over the surface of the propellers, cutting both sides of the propeller at once. The cutting tools are controlled in such a way that they shape the propeller to the exact proportions of a small wood or plaster model, one-fifth the size of the actual propeller blade. The finished blades are turned out with an accuracy of one one-hundreth of an inch of the correct contour.

Then there is the electronic sewing machine. By using radio-frequency current instead of ordinary needle and thread, it stitches a thin solid seam in fabrics that have been coated with a special thermoplastic material; the bond so created is as strong as the plastic itself.

The same principle is used in electronic control of spot welding, to join two pieces of metal together quickly and precisely. This method will ultimately replace riveting in airplane construction.

When it comes to accuracy of the eye, man isn't in it with the electron. A new device called a spectrophotometer can distin-

guish 2,000,000 tints, while a good artist can discern only 10,000. This machine, eliminating guesswork in matching colors, is valuable in the dyeing of fabrics, guaranteeing that each dye bath is the exact tint wanted.

Electronic machines today are used in tobacco factories to detect imperfect ten-cent cigars which are sold as 'five centers.' In canneries they sort out off-color or spoiled peas, beans, oranges, and other vegetables and fruits. In a strip mill, photo tubes are used to detect pinholes in the steel. They control the thickness of steel with an accuracy of which man is incapable.

X-rays peer into metal castings, to discover defects that can't be found by any other means.

Di-electric heating, by which it is possible to heat an object from the inside out, is used in gluing plywood together, and in molding plastics. In medicine, it helps to induce artificial fever for treatment of sinus trouble, venereal disease, arthritis, and other ailments.

Electronic devices are being used to dehydrate milk. Mechanical means of dehydration leave in 2% of the water. Electronics can cut this water content in half and thus make it possible for dried milk to withstand even tropical heat.

Another electronic creation is supersonic waves—or sound waves of such a high pitch that they cannot be heard by humans. These vibrations are used in killing certain forms of bacteria, in processing liquid materials, in making better homogenized milk, and in speeding up the usual ageing process of wines.

To accelerate the wartime output of aluminum, industry turned to electronics for the large-scale conversion of alternating current to direct current. An electronic device, with no moving parts, replaced a costly motor-generator, resulting in an $800 saving in power cost for a 300-kilowatt unit.

The mechanical man can taste, too, and is being used to assure uniformity of flavor in food products. He demonstrates his brain power in lightning calculating machines that never make a mistake.

In farming, supersonic waves are being used to treat seeds and stimulate plant growth. The chromosome make-up of seeds is rearranged by X-rays, to create entirely new varieties. And Dr.

Irving Langmuir, a General Electric scientist, says it should be possible by the use of electronics to have an orchard operated entirely without workers. An adaptation of the electric eye and the techniques of television should, he says, 'make possible the construction of a machine that will scan the green tree, locate the red or orange colored fruit and direct electrically-operated mechanical arms to pick it from the branches, sort it according to size and quality, and convey it to the containers. The machine could be set to collect only fruit of any desired degree of ripeness.'

Electronic devices are revolutionizing the mining prospector's technique. Each mineral responds differently to selected frequencies of ultra-violet light. The geophone, a metal locator, tells him if metal is near the surface. And he can map the geological formation of the territory by means of sound waves transmitted into the earth, from the timing and degree of reflections of which the various strata are calibrated.

In medicine, electronics is used in measuring 'brain waves,' or minute electric currents emitted by the brain. Such readings help doctors in diagnosing epilepsy, tumors of the brain, and similar disorders. Recently an electronic finger was used in New York to remove a two-and-a-half inch sewing needle from a woman's heart.

The electron microscope is opening up a whole new field to science. Ordinary optical microscopes are able to magnify an object only 2,500 diameters. But with the electron microscope it is possible to magnify up to 100,000 times. For the first time, man has been able to see and photograph a molecule. And he can study minute bodies in viruses which were hitherto invisible.

Postwar aviation will, of course, make use of radar, which is still one of the war's more-or-less secret electronic devices. Flight control is already being handled over electronic radio beams. And, by electronics, robot balloons assemble weather readings and transmit them to forecasters on the ground.

Yes, electronics will make life easier and simpler in many ways. But there is no getting around the fact that the electronic man will compete for many jobs now being done by human workers. The

nature of the threat is shown by this example: machines that do precision grooving, now operated by skilled workers, can be converted to automatic electronic control for 10% more cost—and will then turn out 67% more work than a human operator can.

The engineer, rightly enough, feels that the human repercussions of electronics are not his worry. They are the worry of the economist and the planner. Science has given man an instrument that can give us shorter working hours, more leisure, and more things to buy at a much lower cost.

Or, if misused, the robot can oust the human worker from his job, setting in motion an infinitely more vicious cycle of unemployment than we have yet seen. The social effect of discoveries depends on how they are used.

—Matt Bartley Smith

EDITOR'S NOTE: *The 'human repercussions of electronics' (and every other technological advance)* must *become the 'worry of the engineer.' Technocracy states unequivocally that the march of events will soon force the scientists, technologists, and engineers of North America to assume responsibility for production* and *distribution.*

Men and Machines

★ A REVOLUTIONARY DRILL which will dig holes for telegraph poles or fence posts in less than 3 minutes has been introduced in Canada by the Canadian National Telegraphs and is now in use along the company's lines, it is announced by A.P. Linnell, general superintendent, western region. The new equipment saves about one hour's time per post compared with that required by hand digging in average ground and up to 7 and 8 hours through frost and hard pan.

The drill is installed on the back of a standard D-2 Caterpillar tractor and will dig to a depth of 7 feet. Extensions can be obtained up to depth of 10 feet. It also has a changeable auger and will dig a hole up to 24 inches in width. The C. N. Telegraphs is presently using 16-inch and 20-inch augers. The drill will dig a hole at almost any angle.

As previously used in parts of the United States, the drill has been mounted on a trailer, but the C. N. Telegraph engineers found that a tractor is more practical as it allows the drill to be moved rapidly over almost any type of ground.

—VANCOUVER NEWS HERALD

★ EVERY CITIZEN MUST BE MADE to realize that the technological status of society cannot be left to the haphazard workings of erratic, indeterminable forces, but must be the result of intelligent planning. It is useless to lament the evils of modern science. The job ahead of us is to devise scientific controls that will eradicate these evils, that will enable us boldly to exploit the tremendous power of the machine age for the social good.

—JOSEPH MINDEL in *Tomorrow*

Big Business Shows Its Hand

Big Business proposes that the billions of dollars worth of plants that private enterprise was unable, or unwilling, to build for the war effort shall revert at the earliest possible moment to private control—or be closed or torn down.

WASHINGTON.—Cloaked in fine phrases of 'protecting private enterprise' and defending the 'American Way of Life,' history's greatest bilking of a Nation's population is building to a crisis here as bidders scan the Government's $16,000,000,000 holding of war plants for choice morsels.

Pattern for the great deception has been neatly laid before the Senate Small Business Committee by a parade of distinguished and reputable businessmen.

Its keystone is 'get the Government out of business.'

These businessmen have no intention of stealing the Government plants. They all argue for payment of a 'fair' price. Their intentions are 10% honest—within the code of competitive enterprise as they have known it.

They propose that these billions of dollars worth of plants that private industry was unable, or unwilling, to build for the war effort shall revert at the earliest possible moment to private control—or be closed or torn down.

These are not interpretations but direct statements of distinguished men of business who have been telling Sen. James E. Murray (D., Mont.) and the Small Business Committee what to expect in the line of 60,000 new businesses in the aluminum and magnesium fields after the war.

The businessmen are also perfectly honest in the position that they want those now operating the Government plants to have first chance at getting them.

The 11,000,000 men now in military service would get, at best, second choice since they do not have the 'experience, the knowhow and the background of operation.'

The little businessman who was frozen out of war contracts would, likewise, be sidetracked.

Entirely excluded are the workmen who have turned the wheels of these plants during the war and bought bonds and paid

taxes to make their construction possible.

The committee has heard so much emphasis on the factor of employment and the necessity of turning the war plants over to peacetime production for the purpose of supplying jobs that some of its members must have begun to wonder if the profit motive of industry had been forgotten.

Among the frankest witnesses before the committee were E.E. Wilson, president of the Aeronautical Chamber of Commerce of America, and Henry J. Kaiser.

'With regard to plant disposal policies,' Wilson said, 'this industry can only assert that in general it feels that disposal of Government-owned aluminum and magnesium plants should be handled similarly to the disposal of steel, shipbuilding or aircraft plants.

'The guiding principles should be the safeguarding of free private enterprise, the encouragement of competition and the avoidance of subsidy or Government operation.'

Kaiser, the 'miracle man,' was the most fulsome witness on the employment angle of reconverting war plants. He insisted as vehemently as other witnesses that Government must turn all the war plants over to private industry. **—Milton Murray in PM**

★ **THE CHINESE were the first to discover a practical method of paper making by the weaving of fibres. They made paper first on coarsely woven cloth moulds and later with moulds of thin, parallel bamboo strips, held in place by silk threads. The Arabs of Samarkand acquired the art from the Chinese, and they were followed by the Persians. The Moors introduced it into Europe in the 12th century via Spain, whence it was carried to Italy, France, the Netherlands and Germany. Paper making was begun in England in 1492, but apparently died out until reintroduced nearly a hundred years later. It did not become firmly established there, however, until closing years of the 17th century. The production of paper in Canada dates from 1803. In 1917, when accurate statistics of paper production were compiled for the first time, the output totalled 856,000 tons. In 1943, the production was almost five times that figure.** —Dominion Bureau of Statistics

★ **THE OUTPUT OF ELECTRICITY from central stations in Canada during the first four months of 1945 increased from 13,619,125,000 kilowatt hours to 13,667,586,000, there being a gain in April from 3,277,198,000 to 3,534,157,000 kilowatt hours, making a new record on a daily basis. The gain was in secondary power, which rose from 263,911,000 to 668,666,000 kilowatt hours.** —Bank of Montreal

Casualties on the Home Front

With the advent of Total Conscription, women will receive an income equal to that of men. Persons who found their married life intolerable could thus go their separate ways without fear of economic repercussions.

WHILE thousands of young Canadian lives have been snuffed out on foreign battle-fronts in this global total war, tragic casualties have also inflicted on the domestic life of the home front. Having their roots frequently in the trouble-rich soil of an insecure prewar period, many marriages are cracking up under the added social strains which are being presently imposed upon them. Under wartime economic disturbances they are snapping, thereby dealing a heavy blow to the home, which is generally conceded to be the principal bastion of national solidarity.

Marital upsets fall into three general classes—divorces, legal separations and desertions. The first two we shall pass over as they are in the great minority, although in this connection it might be mentioned in passing that British Columbia has the dubious honor of leading the Dominion in the complete absolution of marriages. The third, desertions, we shall give some consideration as it is a problem which has increased to sufficiently great proportions to warrant special attention by our law courts.

What happens, when, in the latter case, a man deserts his wife and leaves her to shift for herself? In Vancouver, the answer to that is found in the recent establishment of a Family Court, the sole purpose of which is to investigate desertions, non-support cases and other family troubles, and to arrive at solutions thereto. Previously, these cases were handled in the regular Police Court, but the continual increase in their numbers necessitated the creation of the special court on March 1, 1945. As this venture is still somewhat in the experimental stage, it will be more efficacious to consider the procedure prior to the transfer.

When a woman's husband deserted her, she would go to the

City Prosecutor's office where the particulars of her case were regarded. If considered worthy, a summons under the provincial Deserted Wives' Maintenance Act was issued against the husband ordering him to appear in court to give reason why he should not support his wife. If the case were decided against him, the presiding magistrate ordered him to pay to his wife a proportion of his salary each week.

The more conscientious husbands usually abided by the magistrate's decisions and came through with the stipulated amount, but others who were not so inclined proved difficult. Non-payment resulted in further summons to court to explain the failure, and if too flagrant instances arose, the errant spouse was incarcerated for not obeying the court order. This, however, availed the wife little materially, except that she became a civic ward during the term of her husband's imprisonment, and, by being a social burden, ensured herself of a measure of subsistence.

Just how far the new Family Court will be successful in meeting its requirements is a matter to which only time can give the answer. It is, like the Police Court before, dependent upon the indulgence and conscientiousness of men already poorly disposed toward their wives for the success of its idealistic enterprise.

The crux of the matter is that unless a man voluntarily supports his wife or abides conscientiously by a court order, there is not a great deal that can be done about it. If he is sufficiently opposed to payment, the threat of jail will not greatly worry him, and, as already intimated, his imprisonment will not benefit his wife.

Actually, if two married persons for any cause whatsoever find they cannot live together, there is no reason why there should be any restraining bonds to keep them from absolute mutual freedom. A man should not be required to support a woman for whom he no longer holds regard; and a woman should not have to rely on such a one for the provision of her economic requirements. Separate and like incomes obviate the necessity of any interdependence between the estranged couple.

Under Technocracy's Victory Program of Total Conscription, such separate incomes would be forthcoming to all persons. This

program—the Total Conscription of Men, Machines, Materiel and Money with National Service from All and Profits to None—would place all persons in the same category of pay and service as the men in the Armed Forces. Besides the provisions of rent-free living quarters as well as free food, clothing and medical care, every person would receive payment which in no case would be less than that received by a private in the Army, and it would be free of all encumbrances such as taxes, insurance or bond reductions. These benefits, which far exceed those the average person receives under present haphazard controls, would be the assumed responsibilities of the Government in order to release all persons from economic worry so they might devote their whole energies to the one big job of bringing the war to an early conclusion.

It is obvious what an effect such a program would have on the problem under discussion. Persons who found their married life intolerable could go their separate ways without fear of economic repercussions. If there were children, they would receive every benefit available, and would only be turned over by the Government to either of the parents upon the sufficient knowledge of their ability to train the children competently.

Incidentally, since the cause of most such trouble is economic insecurity and this cause would be removed by Total Conscription, it is axiomatic that a major cause of domestic disquietude would be thus abolished. The need for a Family Court would also be eliminated, making possible a serenity and tranquillity which is rare in present day marriages.

—Rupert N. Urquhart

★ MORE THAN TWO MILLION TRACTORS today are helping American farmers plow, harrow, plant and otherwise ease the job of raising crops. That is a record number—12.4% more than at the end of 1941 and double the 1929 total.

There has been an even more rapid growth, however, in machines that offer the biggest labor savings. Thus the number of corn pickers in use has increased 29% during the past three years.

One man can harvest as much corn with one of these machines as 10 or 12 men can by hand. Last year International Harvester, largest company in the farm equipment field, produced twice as many corn pickers as in any previous year.

—Wall Street Journal

Canada's Northland

The Land of the Midnight Sun awaits the Technate of the New America. When it comes, the so-called Barren Lands will fade into myth and legend, to be replaced by the great industrial north that will take its part in making this Continent the birthplace of a new race. —TECHNOCRACY MAGAZINE

THIS letter tells what men are doing in making a living and building a civilization in Canada's Northland beyond the rim of dense population, but it is first of all necessary to decide what is North, and how much of the Dominion is to be treated as lying within its bounds. The Montrealer who visits the Laurentians, 50 miles away, is going north; to the Edmontonian, the Peace River is north, and at Aklavik, 2,200 miles by river from Edmonton, one is only half-way between Canada's southern and northern limits. There is nothing absolute about 'north.' Arctic exploration started with a Greek navigator who left Marseilles in 33 B. C. to discover the British Isles. Since then men have continued to push into ever higher latitudes, and wherever they settle becomes the beginning of 'north.' As a matter of fact, not so much of Canada is 'north' as is commonly supposed. Even the most southerly part of England is in latitude 500 miles north of Toronto, and London is north of Winnipeg.

Among foremost enthusiasts for Canada's Northland is Dr. Charles Camsell, Deputy Minister of Mines and Resources and Commissioner of the Northwest Territories. Dr. Camsell was born in the Mackenzie District, the son of a Hudson's Bay Company factor, and has spent the greater part of his life in exploration, his research in the North having won him many honours. In his presidential address to the Canadian Geographical Society in 1939, dealing with Yellowknife developments, Dr. Camsell said: 'In spite of the idea prevalent in certain quarters that residents of the Northwest Territories are "God's frozen people" there is nothing in the climate of that region to prevent people carrying on the same activities all the year round as they do in the City of Ottawa.'

Reprinted from ROYAL BANK BULLETIN.

In fact, Canada's Northland is no more inhospitable in these days than Nova Scotia and New Brunswick were to the British Empire Loyalists who moved up from the thirteen colonies around 1783.

Canada's Northland is a big country, sparsely populated. It slopes toward the Arctic Ocean, which explains why travellers speak of going 'down' north. Including only what is officially designated the Northwest, there are, 1,500,000 square miles with a population of 17,000, of whom 5,000 persons inhabit the quarter-million square miles of the Yukon. In peace time Fort Smith had about 250 persons, while Leningrad, in the same latitude, had 2½ million. But Leningrad is an ancient city, whereas Canada's Northwest is the most recently explored part of this continent, and is just on the threshold of development.

Canada's north can be divided into Northwest Territories, Yukon, New Quebec and the Hudson Bay district. The N.W.T. include the mainland of Canada and the Arctic islands lying north of the Prairie provinces and east of the Yukon, with an area about two-fifths of the total area of the Dominion. Westward lies the Yukon, for nearly half a century known as one of the world's great gold-producing centres and inspiration of poets and authors. Recent developments, growing out of defence measures and the extension of transportation, promise to open a new era in its development. Ontario extends from the latitude of Rome to that of Moscow. Between Georgian Bay and Hudson Bay it bears rich forest, gradually sloping off to mournful muskeg. Underneath are Precambrian rocks, the oldest known to science, containing startling possibilities in mineral wealth. To the east of Hudson Bay lies New Quebec, formerly Ungava. The ice age seems to have passed this way only yesterday, and nature has not had time to finish building the Laurentian world. There are great watercourses, along whose banks the rock has not yet been ground into soil, and inland there are thousands of acres of muskeg which has not had time to develop into earth. Much of this potentially-rich territory has still to be explored, but minerals of economic value have been discovered at accessible points. South of it, the Abitibi region, between the 48th and 49th parallels, has good

quality soils which attracted colonists as far back as 1912, and in 1941 it supported 67,000 settlers. The Department of Colonization believes there is room for 200 new parishes of 200 families each.

Exaggerated ideas of the harshness of a country's climate are given by absence of the shelter and company to which civilization has accustomed people, but those used to the north boast of its clear skies, and the light of the aurora borealis which is sufficient, even in the depths of the northern night, for necessary outdoor occupations.

There is a marked distinction between the climates of the Eastern and Western Arctic regions. Along the Arctic circle the average July temperature ranges from 42 degrees in southern Baffin Island to about 60 degrees on the lower Mackenzie. Some agriculture is possible in the Mackenzie Valley, whereas in corresponding latitudes in the eastern Arctic there is only tundra. No place of record in Canada's Northland, however, can match Yakutsk, Siberia, the cold pole of the world, where there is a population equal to one person in every four square miles, as compared with one person per hundred square miles in Canada's Northwest.

Native inhabitants of the Canadian North are the Eskimos, who have made a living with primitive weapons and implements along the Arctic coast from the Yukon-Alaska boundary eastward. They are honest, intelligent, hard-working people, and Canada is trying to organize affairs in the Northland so that these aborigines and the intrusive white man alike may prosper. Their numbers have increased during the decade between censuses from 6,000 to 7,200, of whom about 1,600 are in Quebec.

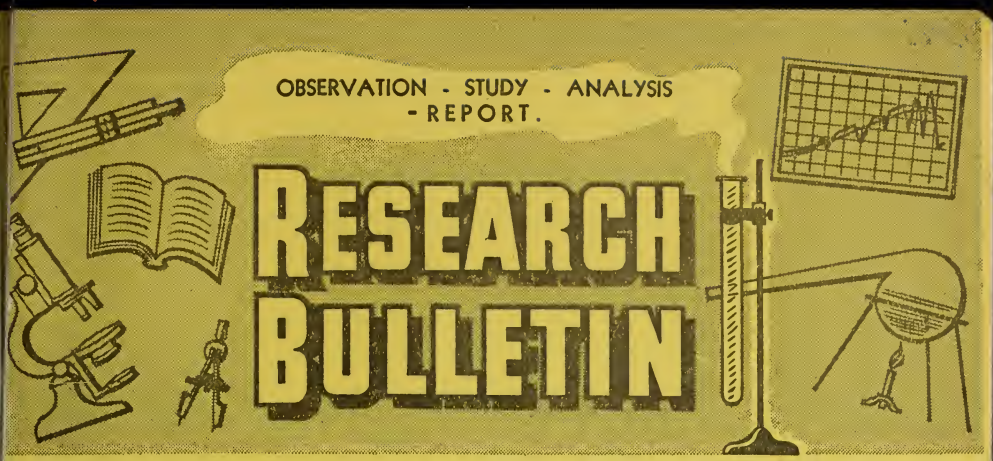
Many people are curious about the plant life of the North, particularly when they learn that ossified remains prove that great forests once grew in the very shadow of the Pole. In some regions of the Northland today vegetation is dense, and in many places there is a bewildering abundance of wild life. One writer says there are 750 species of flowering plants and ferns west of Hudson Bay. Mrs. George Black tells in her biography of assembling 464 varieties of native wild flowers in the Yukon, which 'did much to disperse the too-

prevalent idea that the Yukon is a barren, frozen land.' The 'barren lands' are bare of trees not so much because of very cold temperatures as from lack of moisture. Trees eighteen inches in diameter grow 150 miles north of the Arctic Circle at the Mackenzie delta, but at Hudson Bay the line does not run much beyond Churchill. The Mackenzie forests are chiefly valuable as the source of local building and fuel material, and, so far as is known, there is no timber suitable for exploitation on a commercial scale. Owing to the sluggish growth natural under northern circumstances, trees are replaced very slowly, but authorities hope that with reasonable protection a perpetuated supply may be assured residents.

Merely to tabulate the ascertained and potential mineral wealth of the Northland and near-north would fill a page of this letter. Ironically, disaster and mishap have done more to open up Canada's Northland than have purely exploratory expeditions. The Franklin catastrophe gave the impetus to more than forty search parties during the time when there was still hope of finding survivors, and many others followed in search of a solution of the mystery. Many pages of the report by the late Major L.T. Burwash on his expeditions of 1925 to 1930 are given to information and photos regarding Franklin records, but the rest of the account deals with wild life, mineral deposits, natural resources, climate, travel, and the Eskimos. Similarly the disappearance of a Toronto mining man in an airplane in 1929 caused a fine-combing of the Arctic which extended polar flying knowledge, drew attention to the mineral resources of the far North, and increased public awareness of the developmental possibilities in the area beyond the railway lines.

While no metallic deposits of note are known to exist in the Peace River district east of the Rockies, natural wealth of other kinds begins right at the gateway to the Mackenzie River basin. Here are found 200-foot-thick beds estimated to contain at least 30 million tons of salt. Here, too, are tar sands, coal, gas and gypsum. East of Fort Norman, on the shore of Great Bear Lake, are the pitchblend deposits from which radium is obtained. How these deposits were uncovered

(Continued on Page Thirty-five)



AUGUST, 1945 Compiled By Editorial Staff No. 31

The Story of Canadian Chemicals

INFORMATION regarding the beginning of the chemical manufacturing industry in Canada is very sketchy. The output of the chemical factories in 1890 was valued at slightly more than $2 million, but it seems certain that this included some allied products as well as basic chemicals. The industry at that time was very small—a sulphuric acid plant had begun operations a few years previously, the manufacture of methyl alcohol by the destructive distillation of wood had been started, some nitroglycerine was being made for use in explosives, and some ethyl alcohol was being produced. The next decade, however, saw the start of the electro-chemical industry with the building of a carbide plant at Niagara Falls, and phosphorus works at Buckingham, Quebec.

From the turn of the century to the outbreak of the First Great War there was continued expansion featuring the opening of large works to make carbide at Shawinigan Falls, Quebec, cyanamide at Niagara Falls, Ontario, and electrolytic caustic soda at Windsor, Ontario. With the war of 1914-18, there came heavy responsibilities to manufacture special chemicals for munition purposes and a considerable number of new plants and extensions were erected. Some

of these developments were essentially for war needs, such as the manufacturing of trinitrotoluene, cordite, etc., and were discontinued soon after the armistice, but others were of a fundamental nature and remained as part of the permanent industry. Outstanding among the latter was the synthetic acetic acid and acetone plant at Shawinigan Falls, Quebec.

The period between the wars was characterized by a steady overall advance in both volume and diversity of products, including such outstanding developments as the manufacture of soda ash at Amherstburg, Ontario, and of sulphuric acid from waste smelter gases at Copper Cliff, Ontario, and at Trail, B.C. In this period there was also consolidation within the industry through the merger of smaller units into large concerns. There was remarkable progress also in technical skill, in research, and in the training of personnel. When the present war began, the industry was well fitted in these essentials to undertake the heavy responsibilities that were to be placed upon it.

In the current transformation of Canadian chemical industry for war production, probably no aspect has been more important than the explosives and chemicals program. Before the outbreak of hostilities the explosives industry in this country was occupied almost entirely in meeting ordinary commercial requirements, and consequently the chemical industry lacked facilities to feed a large-scale munitions plant.

In October, 1939, under the Defence Purchasing Board, the future Chemicals and Explosives Branch of the Department of Munitions and Supply was set up to expand explosives production and to place the chemical industry on a parallel course of development. Since that time in every part of the country great plants have mushroomed up. Almost three score separate projects, involving expenditures of more than $160 million, have been undertaken, some being only extensions and others entirely new works, some for explosives, some for shell filling, some for grenades, fuse powders and pyrotechnics, but about half for special chemicals required in the overall program.

It is estimated that the production of chemicals in Canada has

expanded three-fold since the beginning of the war to reach a total value of about $110 millions in 1943. Today the industry stands as one of the nation's leading activities. It now supplies about 70% of the country's chemical needs, and in addition makes a substantial contribution to export trade. It has buildings and capital equipment valued at $120 millions, employs 10,000 people, and distributes annually $18 millions for salaries and wages and $40 millions for materials, fuel and power. It includes some of the largest industrial establishments in the Dominion. This field of manufacture is dominated by a few major producers, with two score or so smaller firms completing the list.

The alkalis division of the Canadian chemical industry is based upon the salt deposits of southwestern Ontario. Underlying the Windsor-Sarnia district is a salt bed of vast extent. The approximate area of this basin is about 3,000 square miles, and the bed at points is 230 feet thick, at which average thickness a block of one square mile would contain 400 million tons of salt. The salt is brought to the surface as brine, of which about half is evaporated to produce ordinary salt, while half is used for chemical purposes.

At Windsor, brine is treated electrolytically to produce caustic soda and liquid chlorine. Built in 1912 and operated continuously since that date, this works added in 1930 an extension to utilize the hydrogen, which formerly went to waste, in the manufacture of ammonia, this being the first synthetic unit in Canada. Other lines have been added from time to time, including bleaching powder, ferric chloride, sulphur monochloride, sulphur dichloride, and sodium hypochlorite.

To meet the demand of the expanding pulp, rayon and cellophane industries in Eastern Canada, a caustic-chlorine plant was erected in 1934, at Cornwall, Ont. In 1938 another was opened at Shawinigan Falls, Que. For these projects the salt is brought by boat from Windsor, the raw material in this instance being transported to the source of cheap power and to the principal markets for the finished products.

Another important plant using salt brine as its chief material is operated at Amherstburg, Ont. Built in 1919, it is the country's

only producer of soda ash and also, since 1934, of calcium chloride, which is recovered as a secondary product in the Solvay process.

While these alkali producers are presently working to capacity and in some instances have extended their facilities since the war, there were substantial imports under these headings in 1943, amounting to 5,798 tons valued at $256,348 for caustic soda and 70,557 tons valued at $1,213,818 for soda ash.

In the acids division of the chemical industry, Canada has long been self-sufficient in regard to inorganic acids, but has been very largely dependent on foreign sources for her supply of organic acids. One of the earliest sulphuric acid plants was at Capelton, Que., at which location there was a considerable supply of pyrites from nearby mines. Built in 1885, it operated steadily until 1925, when it was dismantled.

The first unit using the contact process was built in 1908 at Sulphide, Ont., with pyrites as the chief source of sulphur, and the first plant to utilize smelter gases was established at Coniston, Ont., in 1927. Three new plants have been built since the outbreak of the war to make ten producers in all. Output of sulphuric acid in 1943 totalled 621,435 tons as compared with the highest pre-war tonnage of 282,716 in 1937.

The successful recovery of sulphuric acid from smelter gases has been one of the outstanding developments of the industry. Previously the raw materials for its manufacture were either sulphur or sulphur-bearing ores and, with the exhaustion of the latter, more dependence was placed on elemental sulphur imported chiefly from Texas.

In the search for a cheaper source of sulphur, attention was turned to the sulphur gases which belched from the stacks of Canada's huge metal smelters. In 1927 a test plant was built at Coniston, Ont., in connection with the nickel smelter at that point, and it proved highly successful. In 1930 a larger and permanent unit was established at the smelter at Copper Cliff, Ont.

Even more striking were the developments arising out of the utilization of the gases from the lead-zinc smelter at Trail, B. C. For some time the operation of this plant had occasioned claims for

damages done by the sulphur-bearing gases to crops on nearby lands, and this problem assumed international proportions when complaints came from across the border.

This condition of affairs and the desire to eliminate waste led to an extensive program of research which culminated in the building of one of the largest chemical plants in the country. It was decided to use the waste gases to make sulphuric acid, which in turn could be used to make ammonium-sulphate for fertilizer purposes.

At this point there is now the largest acid plant in the country, a huge synthetic ammonia plant, an ammonium sulphate plant, a phosphoric acid plant, and an ammonium phosphate plant. The final products are the nitrogen-bearing fertilizers, ammonium sulphate and ammonium phosphate, which are chiefly for export. Since 1934 elemental sulphur has been recovered also by means of a new process, this being Canada's only source of pure sulphur. Unfortunately, it is far distant from the large users in Eastern Canada and is shipped chiefly to consumers in British Columbia or the Western United States.

Nitric acid is made at Sulphide and Welland, Ont., and at several explosives plants at other points; muriatic acid in plants at Hamilton and Cornwall; cresylic acid at Toronto; phosphoric acid at Buckingham, Que.; stearic acid and lactic acid at Toronto; and oxalic acid at Hamilton, the last-mentioned being a very recent development.

Glacial acetic acid is made at Shawinigan Falls, Que., in one of the great chemical plants of the Empire. As early as 1903 the power development at this point had attracted a carbide plant which has continued to operate ever since. But during the war of 1914-18 it was greatly expanded. The Allies were then in urgent need of acetone for T.N.T. and later for acetic acid for the manufacture of cellulose acetate, an essential compound for the treatment of aeroplane wings.

A process was worked out by Canadian chemists by which these chemicals could be made synthetically from calcium carbide, and in 1916, at the request of the British Government, the capacity of the carbide furnaces was enlarged, and a large chemical plant was erected. At the close of the war the demand for acetone ceased, and the

company soon discontinued its manufacture, but improvements in its process for making acetic acid and an increasing demand enabled the company to expand its output and ship to markets in all parts of the world.

Continuous research has led to the commercial production at this plant of many acetylene derivatives, including butyl acetate, ethyl acetate, acetylene black, acetic anhydride, pentasol acetate, vinyl acetate, vinyl acetate synthetic resins, dibutyl phthalate, and butyl alcohol. It is interesting to note that production of acetone was begun in 1936 by an entirely new process. In normal times this company is a large exporter, particularly of carbide, acetic acid, acetylene black, and vinyl resins.

In 1943 Canada's exports of acids, chiefly acetic and sulphuric, were valued at $2,519,000. Imports were valued at $4,328,900, with tartaric, acetic, citric, salicylic, boracic, and stearic acids as the principal items.

Still other works in Canada are concerned chiefly with the manufacture of chemicals other than acids or alkalis. At Niagara Falls, Ont., there is the largest cyanamide plant in the world. Started in 1909 with an initial capacity of 5,000 tons annually, subsequent additions and improvements had brought the pre-war capacity to 355,000 tons. This tremendous tonnage is obtained through the operation of what was at that time the largest lime-burning plant in the world, the largest carbide furnaces and the largest liquid air plant for the preparation of pure nitrogen.

The calcium cyanamide, which is made by absorbing nitrogen in calcium carbide at white heat, is used chiefly as a fertilizer, and most of the production is exported. A large portion of the output, however, is used to make cyanide for use by the Canadian mining industry or for export. Sodium silicate has been produced by this company since 1932.

Phosphorus, phosphate chemicals and chlorates are made at Buckingham, Que., the plant there being the sole producer of these items in Canada. Established in 1897 to utilize the phosphate ores in the vicinity, it has been operating for some years mainly on imported rock. Phosphorus and phosphoric acid were the main products for

most of this period, but in the past decade the company has gradually developed a very diversified line of chemicals including monosodium phosphate, disodium phosphate, trisodium phosphate, calcium phosphide, sodium acid, pyrosodium phosphate, barium chlorate, ammonium chlorate, sodium chlorate, potassium chlorate, and potassium perchlorate.

There is another important works in the general chemical field at Hamilton. Besides sulphuric acid, this plant produces Glauber's salts, salt cake, anhydrous sodium sulphate, sodium metabisulphite, sodium thiosulphite, liquid sulphur dioxide, ammonium chloride, and zinc chloride.

Ammonia and its compounds have been in heavy demand for war uses, and facilities for increased capacity have involved major expenditures in the last few years. At the outbreak of war, synthetic ammonia was being made at Trail, B. C., for use in nitrogen fertilizers, and at Windsor, Ont., for the manufacture of blasting explosives, and some aqua ammonia was recovered from gas liquor in a plant at Toronto.

War requirements brought expansion of the Trail facilities as well as a new government-owned unit at that point, a new plant at Calgary, Alta., operated on behalf of the Government, and a new works near Welland, Ont., also built for the Government but operated by a private company. The Calgary works is unique in that it uses natural gas as its primary material; at Welland the coke process is used. All these plants make anhyrous ammonia and ammonium nitrate.

In 1943 when war demands slackened and a shortage of fertilizer developed in the United States and Canada, steps were taken to utilize the excess ammonium nitrate capacity to provide a material suitable for fertilizer use. This was made possible by a research program which resulted in the making of a prilled or pebbled form of ammonium nitrate, properly conditioned to render it free flowing when used. A large tonnage of the nitrate was exported to the United States in 1943. **—Dominion Bureau of Statistics**

The Science of Silicones

ONE of the new scientific developments which are widening the use of electrical power was outlined in Toronto recently by R. W. Kolderman of Dow Corning Corp., Midland, Mich. Foreshadowed were major changes in design of electric motors, and important new developments in power use.

Behind these expectations lies the recently developed group of chemical materials known as 'silicones,' whose commercial uses are now being actively explored by industrial firms in Canada and the United States.

Here are some of the things that are being claimed for the new materials according to Dow Corning:

Traction motors with theoretical service life of 400 years;

Reduction of 50% in size and weight of motors necessary to deliver a given horsepower;

Motors that will start when wet;

Water-repellent coatings for high frequency transformers, drastically reducing power loss;

Coatings for tableware and textiles that will make a completely waterproof surface;

Lubricating oils that will remain stable at very high and very low temperatures.

Silicones, an entirely new class of material, are derived from sand, brine, coal and oil. Most important property is heat resistance to temperatures up to more than 500 deg. F.; plus water resistance, resilience, and a high degree of stability. They might loosely be described as a cross between glass and organic plastics, combining the flexibility and versatility of plastics with the stability of glass.

Also a cross between chemicals and glass is the first firm to make silicones for sale: Dow Corning Corp., formed in 1943 by Dow Chemical and Corning Glass to make and sell the products their research had developed. Under the stimulus of U.S. Navy interest in many of the products, a new plant has been built in Midland,

Mich., and will shortly begin operations, **The Financial Post** is informed.

Dow Corning's present silicone products appear in four major forms. First to be developed (1941) was DC 993, a varnish with an exceptional heat stability.

Electric motor designers, formerly hampered by the lack of heat-resistance in varnishes used to make insulating material watertight, will now find this limit raised sharply. Silicone-varnished fabric can be used at temperatures as high as 500 deg. F. without carbonizing.

As a result, it is possible to reduce the size of motors and develop equal horsepower by operating them at higher temperatures. An example: a 415-lb. motor delivered 19 h.p. running at a 'hotspot temperature' of 105 deg. C. With silicone insulation, the weight was reduced to 207½ lb. and 10 h.p. delivered at 175 deg. C. On the other hand, Westinghouse rewound a three-horsepower motor with silicone insulation and had it delivering 10 h.p.

Silicone people are hopeful of 'vacuum cleaners as light as carpet sweepers,' but are still cagey about getting the full advantages for smaller electric motors. If they succeed in packing greater power into motors of the electric razor size, broad new opportunities for industry are indicated. Whatever is achieved in this direction, the silicone experts are definite about their ability to increase the life and reliability of all sizes of motors.

Enamel made from this resin can cut down the space which must be devoted to insulation of ovens and refrigerators. High-temperature-resisting paints can be produced. Mr. Kolderman displayed one which had been baked 120 hours at 250 deg. F. without apparent change.

Second form of the D.C. silicones is a water-white fluid—a lubricating liquid which doesn't become stiff at low temperatures or thin at high temperatures. One current use for this is as a hydraulic fluid for 'damping' vibration of aircraft instruments.

From this type of silicone comes the waterproofing process which cuts down electric leakage of radio equipment in humid zones, and is used to impregnate high frequency condensers. Water beads on

the surface of a treated article, so that there is no conduction between one drop and the next.

The plastics industry is interested in this as a 'mold release lubricant'; the material doesn't mix with the plastic, so that it can be used to line a die in which an article is to be molded; then, instead of sticking inside the mold at the end of the process, the article parts easily from the sides of the die.

Most discussed silicone material is 'bouncing putty' . . . the one joker in the pack, Dow Corning points out. It is a sort of plasticene which flows dismally when left to itself, stretches when pulled slowly, bounces sharply when rolled into a ball, and fractures if struck with a hammer. Since this intriguing material was first announced, producers have been deluged with suggestions for its use in articles ranging from golf balls to chewing gum. Dow Corning is going to try it out on the golf course this summer, but to date there is no known niche for bouncing putty.

It has two very valuable properties, however. First, it is such a fascinating plaything that it arouses a potential customer's interest in its entire family; second, its appearance convinced researchers that it was possible to make silicone rubber.

Dow Corning's silicone rubber, called Silastic, has physical properties similar to those of natural rubber, high heat resistance, resilience and a good resistance to chemical corrosion. This makes it valuable for aircraft gaskets. It is also extruded as a covering for high temperature lead wires, so that, for instance, the ignition system of an automobile need not be spaced so far away from the heated parts. Silastic cannot be combined with other rubbers at present. The strength of silicone rubber is not yet sufficient for use in tires, but Dow Corning, Westinghouse and General Electric all stress that it is just in its infancy, and that a tire may some day be produced which, because of the silicones' high resistance to heat, may last as long as the car.

Earliest research on silicones was done by an English chemist, F. S. Kipping, who devoted his life to the study, retiring in 1935 with the conviction that silicones were very interesting materials which had no commercial use. Later researchers applied polymer processes

which led to the discovery of a whole new field of uses.

Canadian firms have already been making enquiries about certain silicone products, Mr. Kolderman informs **The Financial Post.** Dow Corning intends to arrange a Canadian distributing channel when supplies warrant. Output of the new plant about to open is expected to make some supplies available. Until production is larger and more stable, however, price is expected to class silicones as 'premium materials' for some time yet.

—Jean Edmonds in The Financial Post

EDITOR'S NOTE: *The use of silicones will have a far-reaching effect upon our present social structure. Increasing the longevity of motors and reducing their size per h.p. will lead to a great decrease in man-hours in producing, installing and maintaining power machinery.*

Germanium Riddle

ITS history reads like a riddle. Known before it was discovered, overlooked and wasted for fifty years thereafter, its value was finally appreciated, but no sooner was it reborn than it was once again consigned to near obscurity.

This almost bizarre chain of facts surrounds the all but unknown member of the carbon family, germanium. Thought by many to be an oddity, this silvery metal is nevertheless considered in some quarters to be of such importance that the heavy shroud of wartime secrecy now wraps it in official mystery.

The known facts, though sketchy, are stimulating fuel for a curious mind. Once tantalized, one's curiosity begins to feed on itself, until the trail leads to Eagle-Picher Company, the only domestic concern recovering the metal in quantities greater than capsule samples. But this is getting ahead of the story.

Strange fact to the layman is the fact that germanium was actually described in detail years before it was discovered. Mendelyeev, famed scientific architect of the Periodic System of the elements, pre-

dicted in 1871 that several new elements—he called them eka-boron, eka-silicon and eka-aluminum—would be found. Fifteen years after the Russian chemist described their physical and chemical properties, Clemens Winkler did at last isolate eka-silicon and called it Germanium. In so doing, Winkler found that his find was an almost incredible fulfillment of Mendelyeev's prophecy.

Some of the most significant work in recovering germanium has been accomplished by Eagle-Picher technical men, who first discovered the rare element in waste products of the company's zinc smelter approximately a decade ago. These men explain that the metal is like the 'frog on the knot on the log in the hole at the bottom of the sea,' for the elusive chemical is actually a by-product of cadmium recovery, itself a by-product of zinc recovery, which, in turn, represents only about 5% of the mined ore.

A great deal of searching work followed at the Henryetta, Oklahoma, smelter and the Joplin, Missouri, research laboratories until Eagle-Picher had at last devised a way of capturing and refining it. That a feasible way has been found is mainly to the credit of a persistent group of pioneering metallurgists and chemists, F. G. McCutcheon, H. R. Harner, C. J. Sommerville and Research Director E. W. McMullen.

Four years ago, before Eagle-Picher began salvaging the Winkler metal, germanium's price was $4,500 a pound, but the world's supply was weighed in grams. Today Eagle-Picher's growing production has pushed the price down to $200 a pound, and there is talk of an eventual ton or more every year. Their biggest shipment—and the world's too—to date, 15 pounds, came last fall.

Normally, you'd think that a substance costing so dearly would look as precious as its price. However, if you saw a piece of it on a table, you'd pass it off as an innocent looking, zinc-like alloy of no special value. Then, if you picked it up, you'd exclaim at its lightness. Unusual, too, is the fact that it is so hard that it will cut glass almost as easily as a man cuts his cheek during a hurried shave. Further investigation would show its unusual chemical and electrical properties—for example, it is not attacked by boiling concentrated hydrochloric acid.

Few things are yet known, publishable things, that is, about germanium's possible uses. Someday you may have germanium-gold alloy inlays in your molars, for the metal has the exceptional ability to expand on cooling, thus filling every crevice of a cavity.

Then, too, a moderate touch of it in magnesium or aluminum castings is said to make alloys of very high fatigue and corrosion resistance, and suggests utility in the field of small, light-weight aircraft motors or accessories. Even now it is suspected that the good performance of certain Continental magnesium alloys is due to the presence of germanium as a trace impurity in the metal.

The silvery element also imparts special refractive properties to optical glass. In camera lenses that may be translated into sharper pictures.

This rarer-than-gold material is carried in zinc and lead ores mined in the Tri-State district where Missouri, Kansas and Oklahoma join. From the 15,000 tons of this ore milled daily at the sprawling Eagle-Picher Central Mill, hardly more than ten pounds of germanium can be recovered. That's only about a handful for every ore train 350 cars long.

In ultra-simplified form, here's how the recovery technique progresses after the zinc concentrates reach the Henryetta smelter in Oklahoma. First, cavernous roasting ovens burn off the sulfides. The zinc oxides thus formed are sintered—slowly burned with salts and semi-anthracite coal. It is here that dense fumes carry off the cadmium and germanium.

Piped into and caught by a Cottrell precipitator, the fume-carried metals are next dissolved in sulphuric acid. After cadmium separation, the compounds left are of high germanium content. Though once wasted, this valuable remainder is now shipped to a Curie-like pilot plant next to the research laboratories at Joplin, Missouri.

There the friable and dirty bluish gray material containing varying amounts of some twenty metals, including germanium which is worth about a third of its weight in gold, is first oxidized in a furnace, and then mixed with concentrated hydrochloric acid.

Distillation follows to free the germanium from every trace of

the associated metals, and it is in these steps that the chemists' skill is most apparent, for the trick is to know not only what reagents to use but exactly how. Even slight deviations will queer the whole batch. Finally, after ten days in process, about $80 worth of germanium is cupped in the bottom of a crucible. Unusual among metals is the fact that the refined germanium is made so pure that even the sensitivity of a spectroscope will actually detect no foreign matter.

From Joplin, the precious metal is parceled out to a dozen close-mouthed agencies. It then drops from public sight. When the war is over, it will be time enough to unfold the next chapter of the continuing germanium riddle. In the meantime, it cannot be hidden even by an airtight official information vacuum that germanum is fast taking its place as one of the most unusual metallurgical finds in more than half a century. **—Monsanto**

EDITOR'S NOTE: *That scientists can predict future discoveries and events with almost unerring accuracy is dramatically high-lighted by the isolation and current use of germanium. Mendelyeev predicted in* 1871 *that this element—among others—would be found, and through scientific determination was able to project its most probable weight, color, melting point and other qualities with great accuracy. Similarly in the scientific projection of the next most probable state of social operation on this Continent, Technocracy is able to determine what will be the only method open to North Americans.*

Canadian Economic Conditions in 1944

ECONOMIC activity in Canada last year proved to be a record. The index of the physical volume of business based on factors representing the trend of production and distribution averaged 236.8 compared with 235.9 in the preceding year. Productive operations reached a new high point despite the recession in the later months of the year. The remarkable advance, from the outbreak of hostilities to about one year ago, resulted in a level of operations far higher than in any other period in Canada's history. The index in the last month of the year showed a slight increase over the preceding month. Wholesale prices were relatively stable during 1944. The index, how-

ever, was 2½% above the average for the preceding year. The marked advance between September 1939 and the latter part of 1943 re-established the parity with the base. The index passed through the base line in July 1943 and has since fluctuated slightly above that level, the index averaging 102.5 during 1944.

The components of the index of the physical volume of business were uneven in 1944 compared with the preceding year. Mineral and manufacturing production were at slightly lower levels. The distribution of commodities was in a considerably heavier volume than in the preceding year. The index of mineral production based on 15 factors receded from 242 to 226, a drop of 6.5%. Coal production was 4.6% less than in 1943 while the decline in gold receipts at the Mint was nearly 21%. It is estimated that the value of mineral production was $482.3 million in 1944 against $527.9 million in the preceding year.

The index of manufacturing production which had been 293.9 in 1943 receded ½% to 292.3 last year. The gain in cattle slaughterings was 24.7% and hog slaughterings rose 22.2%. While the output of creamery butter receded 4.3%, factory cheese rose 8.3%. The total output of cheese in 1944 was 178.2 million pounds against 164.6 million in the preceding year. The release of cigars and cigarettes showed a slight percentage increase over 1943. The total releases of cigarettes were 11,666 million while the cigars made available numbered 197.8 million. Due to shortage in the labour force the cotton textile industry was less active in 1944. The raw cotton consumption was reduced from 180 million pounds to 161 million. The output of newsprint showed a slight gain, the total having been 2,991,782 tons compared with 2,982,797. The primary iron and steel industry was more active, the output of steel ingots showing an increase of nearly 1% while pig iron production was 5.4% greater. The output of coke rose from 3.5 million to 4.0 million tons, a gain of 12.8%.

The new business obtained by the construction industry last year recorded a marked increase. Contracts awarded rose 41.7% while building permits in 58 municipalities were 55% greater. Contracts and permits were in much greater amount in 1944, but the index of

employment indicated that actual operations were at a lower level than in the preceding year. The consumption of firm power was 35,151 million kilowatt hours compared with 35,719 million in the preceding year, a decline of 1.6%.

Circulating media in the hands of the public in 1944 rose from $754 million to $908 million, a gain of 20.5%. Cash and cheque payments in the first eleven months were estimated at $78.7 billion against $68.2 billion in the same period of 1943, a gain of 15.4%. Current loans on the other hand showed a decline of nearly 4%, the average in the period mentioned having been $1,008 million. The total revenues of the Dominion Government during the first nine months of the fiscal year, that is, from April to December, showed a decline of 1.2%, the total in the recent period having been $1,940 million. War expenditures receded 12.6% to a total of $2,422 million. The expenditures under the United Nations Mutual Aid Act rose nearly 21% to $674.5 million. Ordinary expenditures were 16.6% greater at $528 million. The national income of Canada, on a tentative footing, moving up to $9,186 million in 1944, exceeded all previous records. The increase over 1943 was 5.3%, the total in that year having been $8,724 million. Income originating in agriculture showed a marked gain, while increases in manufacturing and government were of lesser proportions. The maximum monthly income was reached in October of last year when agricultural marketings attained a high level. The standing in December was $766.3 million compared with $777.7 million in November. The total in the last month of the year was below the level of December 1943, computed at $785.3 million. The deposit liabilities of the chartered banks recorded a marked increase during the war period reaching a new high level at the beginning of December last year. The average for the first eleven months of 1944 was $4,667 million against $3,969 million, an increase of no less than 17.6%.

—Agricultural and Industrial Progress in Canada

EDITOR'S NOTE: *The year* 1944 *was the most prosperous in Canada's history. It is a major indictment of the Price System that it should have taken the greatest war of destruction the world has known to bring us prosperity.*

(*Continued from Page Eighteen*)
makes interesting reading. The first report was made nearly 45 years ago, when the late James Mackintosh Bell and Dr. Camsell surveyed the country. They recorded cobalt bloom stain on lake-wide rocks, and thirty years later Gilbert LaBine read the account, associated the stain with his experiences in Ontario, arrived at the conclusion that there was silver in the rock, and in May 1930 made the great discovery. It is surprising to a layman to observe this lag between discovery of signs of mineral wealth and actual exploratory work. Other examples are the Geological Survey publication of 1898 which reported gold at Yellowknife, 40 years before the ore was produced; and Franklin's record of oil seepages in the Norman area nearly a century before the first well was drilled.

The way we live and travel, and nearly every other phase of modern civilization depends upon the mining of coal, metals and other minerals, and this wealth from minerals is new wealth, creating jobs, products and opportunities. Modern methods are providing assistance in tapping hidden sources of mineral riches. Prospectors are not gypsy-like persons wandering over the rocky hinterland with hammers, knocking off pieces here and there. Electrical determinators are commonplace; those who search for ore are geologists. Advanced methods are necessary, because resources of metals are being rapidly depleted, and if postwar activity is to measure up to hopes then immediate discoveries must be made to stimulate private development. Only new finds can replace exhausted mines, and new mines have been coming in very slowly. A table prepared by a committee of the Canadian Institute of Mining and Metallurgy and presented to the Advisory Committee on Reconstruction last year (1943) shows that in 1942 Canada's metal production came from mining areas discovered as follows: 63% prior to 1910; 11% between 1910 and 1920; 21% between 1920 and 1930, and only 5% since 1930. Mining is important business in Canada, from the standpoint of employment, purchase of machinery and supplies, use of transportation systems, and export. In the year before the war broke out, the number of persons directly employed by the mineral industries was 107,000,

and these supported an estimated 1,200,000 people, or one-tenth of Canada's population.

Under the most difficult and trying conditions the gold mining industry has been trying to maintain its properties in a position to absorb the maximum number of men at the end of the war. Today, with strategic minerals in fairly adequate supply, attention has been turning again to gold. In this resurgence of exploration more than a dozen areas across Canada have taken the spotlight, boasting discoveries of ore of varying importance. In the first six months of this year (1944), mining claims recorded in Ontario numbered 5,570, an increase of 3,770 over last year.

Canada's biggest real estate boom today is in mining claims in the Yellowknife district of the Northwest, where investors are apparently hailing recent discoveries as heralding one of Canada's premier postwar gold camps. Mines cannot be brought into production just now, but they are being found and prospected, so that they will be ready to go into action at the war's end as great providers of employment.

Quebec has been supplying a great deal of ore news and many drills are at work. Development has been steady since the spectacular discoveries of gold and copper in the western part of the province in the years around 1923. Latest gold ore excitement has broken out at Val d'Or, where an extension of the Porcupine break was discovered at the end of July (1944). The mining recorder's office at Amos was overworked as prospectors applied for licenses and registered their claims.

The Northwest has been in the news these last few years for other than metallic mineral discoveries. When Alexander Mackenzie, the young Scottish fur trader, travelled down the river that now bears his name in 1789 he got his shoes blackened with mineral tar, where today there are producing oil wells. Just about the only thing for which Canada can thank the Japanese is the opening up of this territory by road, air and pipeline. The Minister of Mines said in the House of Commons this summer (1944): 'If Japan and the United States had not gone to war, these resources would have been lying there just as they have been lying for a hundred thousand years.' But the Japanese broke loose,

and the Canol project is complete, supplying oil for military needs. There is hope for further discovery, and the territory is opened up to all oil seekers who care to stake their knowledge and capital.

Hundreds of miles to the south are the Athabaska tar sands, now the subject of research looking to a feasible means of extracting oil. They cover 10,000 to 30,000 square miles, and the United States Bureau of Mines has estimated that they contain 250 billion barrels of oil.

Still more fascinating than the story of mineral discovery is the account of development of agriculture in the North, because mining seems to fit better into the northern scene.

Agriculture is actually the biggest of the far North's unknowns. In the Upper Peace there are 11,000 farmers cultivating over a million acres of land, but the Peace River territory is not the farthest north limit of agriculture. Experimental sub-stations have been maintained in the Yukon and the Mackenzie basin by the Experimental Farms System for more than 20 years, and an extension is planned in the near future. With regard to expansion of experimental work, it is interesting to have a report from Dr. E. S. Archibald, Director of the Experimental Farms Service of Dominion Department of Agriculture. Dr. Archibald, a Nova Scotian with degrees from a half-dozen universities, is enthusiastic about the possibilities of farming in Canada's Northland, and has been directing surveys covering northern British Columbia, Alberta, Yukon, and the Mackenzie River basin. While the vastness and the relative inaccessibility of this territory preclude rapid examination or intensive experimental developments, much has been accomplished. In 1943, Dr. Alfred Leahy, soil specialist of the Experimental Farms, made an exploratory survey of soil conditions and agricultural possibilities along the Alaska Highway and on the Whitehorse-Dawson City route. As a result of this survey, and a flying trip into the southern Yukon by Dr. Archibald himself, an article dealing with agricultural possibilities appeared in the **Canadian Geographical Journal** in July. This summer (1944), Dr. Leahy is again in the Yukon, to complete his survey of the highway territory and then swing eastward to the Liard and Mac-

kenzie River areas. Among his assignments is the selection of sites for two agricultural experimental sub-stations, where full-fledged work will be established as quickly as possible to determine the agricultural possibilities of the regions and promote as much development as local conditions permit. 'It is evident,' says Dr. Archibald, 'that the agricultural possibilities of the north country are well worth investigating. I cannot emphasize too strongly, however, that the Mackenzie Valley does not and may not for some time, offer a field for extensive agricultural settlement. Distances are too great, the environment too rugged, and potential markets too small, to justify more than agricultural production subsidiary to other enterprises—fur trade, oil and mining.'

Climate alone is not a bar to agricultural production, as witness the yields of certain crops even within the Arctic Circle in Canada, and far north in Russia. At Beaverlodge, in latitude 55 degrees north, tests have been made of various crops over a period of from 10 to 15 years, with these average yields: Marquis wheat 36 bushels, Victory oats 86 bushels, O.A.C. No. 1 barley 40 bushels, and winter rye 40 bushels. Horses thrive on the range along the 60th parallel; crab-apples ripen beside Great Slave Lake; vegetables and green feed grow at the Thelon sanctuary, at 63 degrees. W.C. Bethune reports common wild fruits occurring almost to Arctic tidewater, and vegetables at Coppermine and Bernard Harbour on the Arctic coast. At Good Hope, close to the Arctic Circle, potatoes have been grown for two generations, and vines were 20 inches tall on July 13th, wth a yield of 393 bushels per acre.

All of the romantic Northland calls aloud to tourists. Practically every family in Canada and the United States is on tiptoe to explore the Northwest just as soon as it can get gasoline and tires. It would be difficult to find another region in the world with equal appeal in beauty of mountains, rivers, glaciers, lakes, and alpine valleys abloom with myriad flowers, while the wealth of game and fish will attract thousands. This development, however, must await the return of peace, and many improvements must be made to the Alaska Highway before it can satisfy the demands of

tourists. Extensions will be required, to reach lakes and settlements. Rest houses and hotels must be provided. But all of these will be worthwhile investments if they bring to Canada a steady flow of tourists, both because of the business gain and the friendship value of such visits.

One of the strange uses of the land they opened up which would surprise the spirits of early fur factors is the grazing of reindeer on a commercial basis. It has been found that the Arctic lichen prairies serve well as pasture land, and reindeer have the advantage of not requiring shelter or much human attention. The Dominion Government took the first steps in 1919 with a view to broadening the basis of subsistence of the natives, when it appointed a Royal Commission to explore the possibilities of developing a reindeer and musk-ox industry. In 1935 a herd of semi-domesticated reindeer from Alaska was delivered on the Mackenzie, and by 1942 the original 2,370 deer had grown to more than 9,000. Headquarters for this unique ranch is in latitude 68° on the right bank of the Mackenzie River, 40 air-miles from Aklavik.

These, briefly, are some of the resources of Canada's Northland. Old problems of development remain, but will be conquered by sufficiency of capital applied to equipping enterprising people to meet northern conditions. The measures taken as a defence against Japanese aggression will turn to advantage to a peace-loving Canada, in cooperation with her neighbours.

Just recently, the Vice-President of the United States suggested that Canada, the United States and Russia should confer on Arctic matters of mutual interest. International cooperation is particularly important in the Northland, to pool the findings of scientific experiments and trial-and-error test. Recognizing this, the Canadian and United States governments have integrated a program of basic geographic and resource surveys. In the Northwest there is a big program under the United States-Canadian North Pacific Planning Project, designed to assess the potentialities of the country in preparation for postwar economic growth. This international study of the comparatively unknown spaces of Alaska, Yukon, Northern British Columbia and part of the

Northwest Territories was inaugurated in January 1943. Canada's own Advisory Committee on Reconstruction recommended last September in connection with immediate postwar employment: (1) that provision be made for training thousands of prospectors; (2) that adjustment be made in respect to taxation that would stimulate prospecting and mine development and mineral recovery; (3) that extensive aerial surveying be undertaken; (4) that steps be taken toward provision or improvement of transportation; (5) that the provinces be invited to confer with the Dominion in a review of 'Blue Sky Laws' with particular reference to their effect on prospecting and mine development; (6) that a body, on which the mining industry should be adequately represented, be set up to investigate the general effect of high taxation on mines and more particularly the possible permanent loss of resources.

Transportation presents merely a handicap to be overcome. Every schoolboy recalls the romantic adventurers who sought the will-o' the-wisp Northwest Passage. Tomorrow's Nor'west Passage seems to be an aerial one, because people in a hurry to get from continent to continent of the northern hemisphere will find their shortest route over the top of the world. Today there is the Northwest Staging Route, the Alaska Skyway, over which men and freight are carried from airport to airport through the wilderness from Edmonton to Alaska. It has meteorological services and radio beacons, installed by Canada and in operation before the United States came into the war. Over it were flown men and aircraft to Alaska and the Aleutians when the Japanese were threatening this Continent. The Northwest Staging Route has opened up the Hudson Bay territory, over which great airplanes beat an air path to Europe.

Completion of the Alaska Highway fired the imaginations of people all over the continent. Today there is a joint Canada-United States Traffic Control Board to deal with applications for travel, which is at present confined to persons on official business, and to bona fide prospectors seeking minerals of strategic importance. All traffic for the highway is channelled through Edmonton, which calls itself the 'crossroads of the world—where

the Alaska Highway begins.' This city now holds the unique record of being one of the greatest military air-freight centres of the world, as it was the greatest commercial air-freight centre before the war.

The days of Service's sourdough are retreating in the face of innovators who are boldly and rationally transforming nature to their needs, but still there must be kept in mind the traditions which move, or at least influence, human beings. Today's problem is not merely a matter of conquering the North. The way to do that has been shown. What is needed now is to domesticate it. The Canadian Arctic has had its great names, like Frobisher, Davis, Hudson, Franklin, Ross and McClintock, but it was the Smiths and the Joneses who discovered that the 'icy fastnesses' could be tamed. They were ordinary people, traders, miners and farmers, who pursued their fortune northward, and made their homes there. The future of the region will depend upon people who have initiative, a desire to succeed, and pioneer courage. Many will come from the ranks of returned service men, who, with adventure still unsatisfied, will join the great army of explorers seeking to unlock the treasure chest of the north. It is not a venture for weaklings. The Arctic climate may be kindly to those who go prepared for it, but no one must be careless when it shows its teeth. Scientific study now being conducted by the Canadian Department of Mines and Resources and the Experimental Farms Service will lay the groundwork for a rational increase in population throughout the Northland, but, aside from mining, any large shift of population will have to await economic developments which cannot yet be foreseen.

★ U. S. TROOPS BURNED THOUSANDS of sheets and blankets and ran a steamroller over tons of crockery before abandoning a large military hospital in Western England recently, J. B. Priestley told a Labor party campaign meeting at Slough, England. Seven grand pianos also were destroyed, he added. Mr. Priestley said the officers and men were reluctant to carry out the orders and that the reason they did it was because they 'still were chained to the lunatic system of profit before distribution.' —CANADIAN PRESS

A Question Answered

Total Conscription will be more necessary in the coming postwar-war than it is and has been during the period of armed conflict. North America must mobilize its resources for the common good.

ISN'T it rather silly to advocate Total Conscription in view of the approaching end of all hostilities and the demobilization of the Armed Forces?

Not at all. Total Conscription will be more necessary in the coming postwar-war than it is and has been during the period of armed conflict. During this present war North America has mobilized only a minor part of her manpower for actual combat; and slightly more than half of her industrial production for the service of supplies. We have been waging this war with Price System methods and winning it the hard way. In the postwar-war that will break out all over America when fighting ceases on the battlefield, the entire population will be engaged.

You say that hostilities are coming to an end. It would be more correct to say that when the battlefield fighting stops, in foreign lands, the scene of hostilities will be transferred to the home front. 'After the Germans and the Japs cease to try to kill us, it will be harder for most of us to remain alive than it is at present.' (**Fortune**, December, 1943.)

Remember this, there were two purposes involved in the design of Total Conscription. These were, first, to provide an overall, industrial, military and social design of national operations for winning this war in the shortest time and at the lowest cost in lives and natural resources; and, second, to provide a design of social and industrial operations to guide America through the transition period when the war came to its inevitable end. We chose to ignore the first purpose of Total Conscription and have waged this war the hard way, the expensive way, the Price System way. We are winning but it is in spite of high cost Price System meth-

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ods. America's great technology is doing the job, plus the fortitude and sacrifices of the men and women in the Armed Forces.

In the postwar era we may choose to ignore the second purpose involved in Total Conscription and attempt to revert to Price System methods as usual. But the past record of business and politics indicates no probability whatever of their capacity to solve America's postwar problems. All that business ever knew was how to buy low and sell high; and how to conspire to maintain scarcity. In essence, this means that the function of business is to prevent distribution. All that politics ever knew was how to juggle conflicting opinions; and manipulate one minority pressure group against another in order to maintain the status quo. In essence this means that politics functions to prevent social change.

These functions of business and politics are normal to an economy of natural scarcity. When any area reaches a stage of potential abundance, these historic functions of business and politics become actively antisocial. In the face of National danger from the Axis Pact of fascism abroad, we found that we had to abandon the traditional functions of business and politics temporarily, and to a certain extent, so as to win this war. This limited abandonment of Price System methods was carefully supervised and severely restricted in order to affect the status quo as little as possible. As the postwar-war for survival spreads throughout the decaying fabric of our social order, the necessity to abandon Price System methods completely and to set technology free will become ever more pressing.

Remember, there will be no end to the postwar-war; there will be no glad, mad day of armistice; no joyous ringing of bells and blowing of whistles to signify peace; no returning home to our loved ones, ever. We will all be in the same boat then. The killing will go on and on under the old familiar pattern of operations entitled 'The Peace of the Price System,' only it will be intensified and magnified by the application of more destructive technology. All the factors of social instability will experience a period of great expansion. Juvenile delinquency will be only a ribald joke when the entire social sys-

tem is delinquent. It will be a succession of black, hopeless months, and perhaps years, wherein the aspirations of men for a better life will be driven into the underground of despair and futility.

The overwhelming majority of Americans will battle against each other in want, insecurity and fear for the dubious privilege of chiselling an uncertain existence out of a dying economic system. While high overhead, above the muck of murder and perversion will reign the blessed, microscopic minority revelling in luxury and abundance, and pulling the strings to perpetuate the God of Things as They Are. This will be the picture of our postwar-war in the richest Continent on earth which is capable now of providing abundance, security, leisure, equal opportunity and physical democracy for all citizens from birth to death. **No tongue or pen can do adequate justice to the hypocritical insanities of Price System methods of operation.**

Remember, too, that the only possible outcome of this postwar-war is either a complete collapse of the entire social system with ensuing social chaos, or another glorious foreign war against some new, great 'evil' thousands of miles away. Foreign wars are always prescribed for domestic difficulties by the quacks who control the Price System. Yes, indeed, our prospects, individually and collectively, in the postwar era are blacker than the blackest hell so long as America continues under the tyranny and regimentation of the Price System.

And you say America does not need Total Conscription! What a strange social blindness this is! If you need a placebo for your tender sensibilities, perhaps you can think of it as Total Mobilization. The name doesn't matter. America must mobilize **all** of its resources for the common good. That's evident, isn't it? The facts are that we have the Men, Machines, Materiel and 'know-how' to set up and operate an economy of natural abundance here, right now. Moreover, we have no choice in the matter but to do it or perish.

We will have to adopt a new concept of citizenship. We will have to abandon our present ideology of **Self Service To Me and To Hell With Everybody Else.** We will have to go in for National Service from All and

Profits to None. We will have to tear down all the stinking Gods of the Market Place and set up a new ideal called 'America the Beautiful.' We will have to organize our entire social system along scientific lines in obedience to the physical laws by which alone it can operate successfully. We will have to relegate the politico-business method of operation to the same limbo where went the divine right of kings, the philosopher's stone of Alchemy, and the oxcart of our grandfather's day.

This we will have to do right here in North America in the coming postwar era or pay the penalty which has always been expected for attempted violation of physical laws.

Do you still think we can win the looming postwar-war against ourselves without Total Conscription? Wake up and investigate Technocracy!

—Public Speakers Division 8741-1

★ FROM RUSSIA COMES NEWS of the discovery of a method of growing pine trees which are expected to produce logs of 20 feet or more in length that will yield boards free from knots. This is something for loggers to think about, if true, and the explanation seems plausible enough, comments *The Forest Log* of the Oregon State Board of Forestry, Salem.

By this method the young pine is allowed to grow a bushy growth near the ground until the tree is about eight years old. From that time on no branches above this lower growth are permitted to develop. This is effected by pinching off all side buds as soon as discovered. Ample nourishment for normal growth is obtained from the bushy branches near the ground.

After the tree has reached a height sufficient to yield a log 18 to 20 feet long, it is allowed to form a normal top. Thus with no branch-bases within this limbless area, the entire log from pith to sapwood will be wholly free from knots.

—B. C. LUMBERMAN

★ WORLD PRODUCTION OF WOOD-PULP in the first year after the conclusion of the war in Europe, including 600,000 tons now in storage in Sweden, is estimated by the United States Department of Commerce, at 24,348,000 tons, while consumption needs are placed at 23,822,000 tons, indicating a surplus of 526,000 tons. The estimates of production are based on the assumption that wood-pulp output, particularly in the United States, Canada and the northern European countries in the first year will be at maximum capacity, consistent with conditions of manufacture, labour, raw material supply, and that shipping from northern European ports will be possible soon after the end of active warfare in Europe. Production in the northern European countries is estimated at 4,377,000 tons, to which may be added the Swedish supply of 600,000 tons in storage.

—B. C. LUMBERMAN

Notes on Organization

Technocracy Inc. stands as a living demonstration that human initiative can achieve what the incentives of this Price System have never succeeded in inducing—the creation of a spirit of 'one for all and all for one' and a morale that is continent wide.

IN a continent-wide analysis of the spread of the Chartered Sections of Technocracy Inc., certain salient facts have been noted which merit discussion. In those regions where the advance has been most rapid, notably on the Pacific Coast from San Diego to Vancouver, the basic reasons are not difficult to find. In the first place, it becomes evident that the citizens there are more open-minded and ready to weigh that which is new and perhaps completely divergent from their inherited conceptions and beliefs. This attitude has proved most beneficial in that Technocracy has been given a fair and complete analysis and thus, with an unavoidably favorable decision rendered, a very considerable group of people are now engaged in furthering the activities of Technocracy Inc.

A second reason lies in the development of capable leadership. As has been pointed out before, the leadership of Technocracy is definitely not limited to engineers and scientists. Whereas it is true that the original plans and the basic principles of Technocracy are largely the work of engineers and scientists, neither they nor the present leaders of Technocracy Inc. ever thought for a moment that the successful working out of the plans could be accomplished without leadership drawn from all professions and industries. A case in point is the able Section leadership on the West Coast which, as evidenced by its variety of capabilities, is fully representative of the functional capacity to be found in a corresponding diversity of occupations. The ability to be a leader, then, is latent in almost every man or woman; and the regions on our Continent where such leadership is sought for and, when discovered, developed and trained, will be those where Technocracy Inc. will most surely and rapidly push forward towards its goal.

'Any living organism seeks its food. The food enters one end of the alimentary canal; waste is eliminated at the other. What occurs in between the two ends is known as functioning.'

The organizational structure of a Technocracy Section is, by analogy, equivalent to that of any other dynamic organism. The structure is schematically outlined in *By-laws and General Regulations*. The problem of organization is, then, the achievement and preservation in the Section of such a state of organic health as shall enable the best possible use to be made of the organism's intake of equipment, money and personnel in furthering its growth and tactical effectiveness.

The routine business of keeping adequate records on Section affairs must obviously be carried out along lines familiar to any office manager. It will be found that the affairs of a Technocracy Section are inherently more complex than those of the ordinary small business; also, the influx of new members must be expected to accelerate by fits and starts as events, in their inimitable way, stimulate the latent intelligence of increasing segments of the populace. Therefore, the office routine must be kept flexible with these things in mind. It is the responsibility of the Section Director, the Treasurer and the Secretary to see that these affairs are suitably planned and capably carried out at all times, as a primary requisite of sound organization. A sloppy set of books or minutes can tie up Section development as effectively as an injured spinal cord can hinder the growth of the living organism.

In planning this organization, and the organization of the various standing committees, many members have some difficulty in realizing that the type of control with which they have become familiar in the course of their previous lives partakes of some noxious elements of business and political administration. When an occasional Section becomes sick and fails to function properly, investigation often discloses the 'bottleneck' bureaucrat, 'business as usual' obstructionist, the 'armchair' strategist or the 'assumption of power' theorist—all cursed with their earlier conditioning, subverting the operations of the Section down to that level, quite innocently unaware of the untechnocratic character of their behavior. Eventually, these people realize that the purpose of an interference control is to *interfere,* to slow a thing down below its natural rates of function. Admittedly, systematic and routine controls must be exercised in order to establish smooth and flexible routine processes—but always with a minimum of interference. Technocracy must look to the industrial flowline, to the continuous straightline productive process, for its functional pro-totypes. In 1914 the mobility of the army was governed by the walking speed of the slowest man. Today the substandard truck or defective part is scrapped or corrected at the factory before the army ever sees it. This is a technique of control involving the elimination of interference, the improvement of efficiencies, the speeding up of processes, the determining of optimum rates, commensurate with steadily improving quality of output.

Returning again to the biological analogy, the elimination of waste indispensible to healthy development consists, in the Technocratic organism, of the 'conditioning out' by individuals or by the various sub-divisions of the organism, of useless or injurious modes of behaviour, combined with the positive 'conditioning in' of useful capacities, in the individual's course of getting his array of abilities into phase with Section operations. It sometimes happens that an individual proves to be completely unassimilable: his usefulness has been impaired beyond any hope of even a percentage salvage. Such events are rather tragic in their implications, they are wasteful and disturbing in their effect, but the law of proportionate aggregates states that they are unavoidable, even as also that law brings forth an occasional directive genius. Similarly, somewhere, occasionally some healthy man eats a ptomaine oyster. The action taken must be drastic: if he waits for nature to take its course, the healthy man will probably die.

In an obviously extreme case the Section must exercise its powers of expulsion. When this occurs, however, it should not be considered as an act of justice or of retribution (in such a philosophical muddle it is always an open question who should expel whom), but rather a case where the observable facts clearly demonstrate a member's unfitness to be absorbed into the functional pattern of the whole. Adequate facts must of course be clearly established, for philosophical hypochondria in a Section seldom justifies a surgical operation. It serves rather to indicate a deeper fault.

People who are neglectful and slovenly in their living habits do not exhibit healthy growth. Poor digestion, and the tendency to quarrel with or merely pass as unassimilated waste most of the things one eats, are symptomatic of an unhealthy organism. So are the gallstones, the boils, the ulcers and the flabby muscles which people permit themselves to acquire. In the same way, where squabbling factions and internecine bickerings occur in a Technocracy Section, as sometimes happens, it is usually the operational structure that is at fault, not often the individuals, even though as individuals people sometimes forget that they do not have to like each other, or even approve of each other, in order to get together and do an engineering job! More often such goings-on indicate that the operational structure is poorly designed and that new members and old members alike are not becoming reconditioned.

A healthy organism equipped with sensitive endocrine nervous controls (that quality often called 'awareness') and healthy enzymes, plus adequate food and living conditions, will exhibit the quality of initiative in increasing the range and degree of its own functioning. This is as true of a healthy Technocracy Section as it is of an individual member. Since no Technocrat ever received any pay, except in those few instances where subsistence is allowed for full-time service, the question of Price System incentives is out; and Technocracy Inc. stands as a monument, a repudiation of the idolatry of Price, a living demonstration that human initiative can achieve what the incentives of this Price System

never succeeded in inducing — the creation of a morale that is Continent-wide in scope; and a set of objectives, upon which that morale is based, that are a materialization of the spirit of 'one for all and all for one': of North America, now and forever.

Such a unique esprit-de-corps has been the unfulfilled dream of the philospher, the general and the statesman alike, throughout all time. Yet only now, at last, is its realization made possible, in fact inevitable, in the dispassionate and irresistable advance of Science. Science, mighty for good or ill, sublimely impersonal, cares nothing for the prejudice, pride or desire of the individual or even of the nation. Individual or national spirit is hardly within the domain of Science. Yet the destiny of Science must be fulfilled and in its fulfillment the vanity of opinion and of individual self-aggrandizement shall be made subordinate to the carefully determined requirements of the task. In the fulfillment of this great destiny shall be found also the fulfillment of the human heart's desire. Technocracy, in bringing to the world 'a new governance of man and things' brings also a new order of human loyalty and a far greater patriotism.

The work that Technocracy Inc. has accomplished, in the face of collective apathy and indecision, is worthy of anyone's respect. Obviously, Technocracy's achievements to date are but a fraction of what must finally be accomplished; but what it has done has been the work of member volunteers, having no resources except their own.

Technocracy likewise claims the respect due to Science in its final maturation as the supremely dominant element in the organization and ordering of society itself. According to *Encyclopedia Americana,* 'Whatever the future of Technocracy, one must fairly say that it is the only program of social and economic reconstruction which is in complete intellectual and technical accord with the age in which we live.'

The statement has been made that, once a member has become in any way a conditioned Technocrat—has, for example, gone through even half of the Technocracy *Study Course*—it is most unlikely that he will ever be anything but a Technocrat. This is no idle assertion. Whether such respect be conscious or unconscious, openly or grudgingly felt, it must be accorded.

In viewing the Technocracy Section as analagous to a living organism, the member is compelled to respect the part he himself plays in its growth and development. Whether that part—his individual job—be great or small, it will not be treated lightly. Realizing the interdependence of the whole Organization, he must understand that, to some extent, the whole operation depends upon himself, and that he must never let it down.

The member accepts the job which he finally intends to fulfill. His first responsibility is to persist in the fact of any and all difficulty until the job is mastered by him, with or without help. His second, and equally important, responsibility is to train another member to stand in, should need arise, as his deputy. Then, the unforeseen disaster—sickness, accident or removal—shall not cause any breach of function and consequent injury to the Section's oper-

ations. The soldier on guard at his post knows that to leave it constitutes a breach of discipline and a danger to all. He knows that the penalty to him will be severe, and to his unit possibly disastrous. The Technocrat, however, is not made subject to disciplinary action in the military sense—for discipline he must look to his own knowledge, loyalty and integrity. Yet his position on his job is essentially no different—in fact, the ultimate importance on his job is far greater, regardless of what his job may be.

It is sometimes found by new members of 'superior' self-esteem that their particular Section, newly formed and struggling with new problems or organization, is not by any means capable of discharging its duties. Perhaps, then, the Section is not worthy of great respect. Be that as it may, Technocracy Inc. as a whole, its achievements and its objectives, must constantly be borne in mind as the Section's pattern and long-range aim. It then becomes the member's unavoidable responsibility to help bring his Section up to standard, overcoming whatever inexperience, ignorance or shortness of vision and judgment as may happen to stand in the way. He will ultimately accomplish this in the same spirit of cheerful co-operation and personal tolerance as he would instil in others! His patience and fortitude will be, if not inexhaustible, at least equal to the strains. No discouragement will turn his determination to find ways and means of seeing his job through. In this he will display those essential qualities of human leadership which have already been so fully demonstrated by the builders of Technocracy in the past. This is the challenge to him who would lead: he is first and foremost a loyal, capable and untiring follower.

Does this constitute a demonstration of heroism and moral nobility above the normal human level? It does not. It is the simple result of the individual's acquired understanding of the factors entering into the problem—the circumstances, the people he works with, the requirements of the job, and himself. It constitutes merely his refusal to be governed by any considerations other than the facts in the case, and his refusal to allow himself to be pulled, pushed or tossed about by ill-adapted internal discharges of those complex protein derivatives, his own glandular hormones—those formidable chemical weapons which may as surely help him to success when they are correctly applied, as to failure when they are allowed to run out of control. A Technocrat learns about handling emotional responses in others; he also acquires controlled skill in the use of his own!

★ THE NUMBER OF PEOPLE WORKING on farms today is smaller than at any time in the past 20 years, which is as far back as Agricultural Department records go. Output per farm worker has gone up 28% during the past four years. The number of acres harvested per man has risen 14.5% during the same period.

What has happened in wartime is a speed-up of a long range agricultural mechanization. The story of what that has meant in farming is shown by the fact that in Colonial times 90 out of every 100 people in this country had to work on farms to grow enough food. Now the ratio is just the reverse. —WALL STREET JOURNAL

TECHNOCRACY

WHAT?

Technocracy is science in the social field. **Encyclopedia Americana** says: 'Whatever the future of Technocracy, one must fairly say that it is the only program of social and economic reconstruction which is in complete intellectual and technical accord with the age in which we live.'

WHEN?

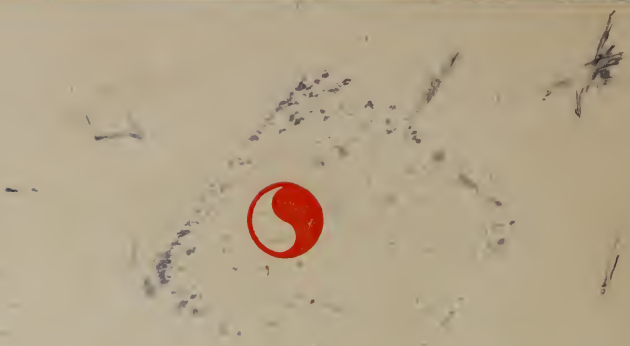
Technocracy originated in the winter of 1918-1919 when Howard Scott formed a group of scientists, engineers, and economists that became known in 1920 as the Technical Alliance—a research organization. Some of the better known names in the Technical Alliance are of interest, such as: Frederick L. Ackerman, architect; L. K. Comstock, electrical engineer; Stuart Chase, C.P.A. (now well-known writer); Bassett Jones, electrical engineer; Leland Olds, statistician (now Federal Power Commissioner); Benton Mackaye (now in the Forestry Department); Charles P. Steinmetz and Thorstein Veblen (both now dead). Howard Scott was Chief Engineer. In 1930 the group was first known as Technocracy. In 1933 it was incorporated under the laws of the state of New York as a non-profit, non-political, non-sectarian membership organization. In 1934 Howard Scott, Director-in-Chief, made his first Continental lecture tour which laid the foundations of the present Continental membership organization. Since 1934 Technocracy has grown steadily without any spectacular spurts, revivals, collapses, or rebirths. This is in spite of the fact that the press has generally 'held the lid' on Technocracy, until early in 1942 when it made the tremendous 'discovery' that Technocracy had been reborn suddenly, full-fledged with all its members, headquarters, etc., in full swing!

WHY?

Technocracy's survey of the economic situation in North America leads to the conclusion that there is in development a process of progressive social instability, that this process will continue until the instability reaches the limits of social tolerance and that there then will have to be installed on this Continent a social mechanism competent to meet the needs of its people. Technocracy finds further that the day when social operations on this Continent can be based on a method of valuation has passed, and that it is now necessary that there be applied in the social field the quantitative methods of physical science. Technocracy, therefore, proposes that the North American Continent be operated as a self-contained functional unit under technological control. This control would operate the area under a balanced-load system of production and distribution, whereunder there would be distributed purchasing power commensurate with the resources and the continuous full-load operation of the physical equipment, with the guarantee of a high standard of living, equality of income, and economic security, at a minimum of working hours, to every adult inhabitant.

HOW?

At this stage the objectives of Technocracy are first, the education of the people of North America to a realization of the conditions behind the social crisis, and second, the organization of all those willing to investigate and interest themselves into an informed, disciplined, and functionally capable body whose knowledge and ability can be called upon to prevent chaos in North America at that time, now imminent, when the Price System can no longer be made to operate.



Can We Win the Peace?

IN THE machinery of the military control commission in Germany, as in Washington, men closely linked with German cartels and friendly to German business and finance occupy key posts. The memberships of the Technical Industrial Disarmament Committees in FEA at Washington were disclosed to the Kilgore committee, and they contain the names of many men from big concerns closely linked with I. G. Farben before the war. Testimony before the committee showed that the Germans are planning to utilize these old connections, and it is the duty of the Kilgore committee fully to explore them and to make the facts known. In this connection I want to call attention to an interesting statement on page 534 of the committee transcript, a passage in an FEA memo on German penetration of French finance during the occupation. This says that all enemy banks were put under German administration, including 'American banks. The Chase Bank and Morgan et Cie., however, the only two American banks which continued operations, received special treatment.' Why did these two leading American banks receive special treatment from the Germans? The question is of especial interest because Chase is the Rockerfeller-Standard Oil bank.

—I. F. STONE in *The Nation*.

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The Sun Bomb's Social Impact

Rushing Toward Chaos!

Science in the Social Field

Technology Revolutionizes Farming

A Ten Year Battery

The Story of Pulp and Paper

'So You Can't Have Health?'

Sept. '45 PUBLISHED IN CANADA BY SEC. 1 - R. D. 12349 TECHNOCRACY INC. 25c

TECHNOCRACY DIGEST

THE ONLY MAGAZINE IN CANADA THAT IS PREPARING THE PEOPLE OF THIS COUNTRY FOR SOCIAL CHANGE

SEPTEMBER, 1945 VANCOUVER, B. C. No. 87

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Rushing Toward Chaos!

THE first impact of V-J Day on employment in the U.S.A. probably will be more stunning than the blows struck against the Nation's economy by the great depression.

'The peace developments in the Japanese war this week confronted the country with unparalleled industrial chaos at home, where up to 10,000,000 workers faced severance from their means of livelihood, not to mention millions of returning veterans who will need jobs.'

With these words **PM** newspaper in its August 11th issue heralded the arrival of the post-war era.

The axe has already fallen on tens of thousands of Canadians and hundreds of thousands of Americans. This to the peoples who voted in political parties that promised them a minimum of reconversion dislocation and full employment.

Technocracy points out that it would be foolish to ask the Government to keep producing unwanted war materiel, merely to provide jobs. Instead of plane plants, ship yards, and munition factories we now need housing, roads, hydro-electric and other public projects. Emergency measures are required immediately to pour our manpower into useful channels.

World War II has taught that the excuse of 'no money' is meaningless. The artilleryman who has shot away $50,000 worth of shells in an afternoon, or the tank crew who have had a $200,000 tank blown out from under them and then gone back for another, or the airmen who have baled out of a burning bomber costing $1,000,000 will take a dim view of a social system that shoves them on the relief rolls, the bread lines, and the freight trains because 'there is no money.'

At present, North America is rushing toward social chaos. Today, even more than at any time in six years of war, the citizens of this Continent need Total Conscription of Men, Machines, Materiel, and Money with National Service from All and Profits to None. Only through such a program can we make a smooth, safe transition from war to peace.

—The Editor

The Sun Bomb's Social Impact

Every technological advance has been a bomb disintegrating the Price System structure. But to the average person it has been a comparatively slow and unspectacular process. Then, with the impact of the sun bomb, millions of citizens in a dazzling flash have seen the black mountains of technological unemployment in the postwar period. In the midst of the chaos and confusion caused by clinging to Price System methods in the Power Age, Technocracy goes calmly about its task, the only Organization in North America that is preparing to utilize scientific discoveries for the social welfare of mankind.

THE use of atomic energy—which is being called 'possibly the greatest scientific discovery of all time'—is an event of planet-shattering consequences in war and peace.

The atomic bomb that was used against Japan produces more than 2000 times the blast of the largest bomb ever used before. The Halifax Explosion of 1917, in which 3000 tons of TNT discharged, was only one-seventh the impact of this new scientific missile. One atomic bomb equals five trainloads of TNT, or two cargo shiploads, or 6600 Flying Fortress loads during their first strikes against Berlin, or four times the weight of the heaviest U.S. day's assault against the entire Japanese home islands, or forty times the weight of the biggest assault of the London blitz. And the bomb is said by the science editor of the London **Times** to contain only about one pound of uranium; the whole mechanism is reported by a British air ministry official to be just 400 pounds.

The target, Hiroshima—an important Japanese army base—was razed 'as if by a bulldozer.' Gen. Carl A. Spaatz, strategic air force commander, said that 4.1 miles of the city's built-up area of 6.9 miles were wiped out.

Tokyo radio broadcast that 'the impact of the bomb was so terrifying that practically all living things, human and animals, were literally seared to death by the tremendous heat and pressure engendered by the blast. All of the dead and injured were burned beyond recognition.'

President Truman disclosed that the Germans 'worked feverishly' in search of a way to use atomic energy but failed. Mean-

while American, Canadian, and British scientists studied the problem and developed two principal plants and some lesser factories for the production of atomic energy. 'We have spent two billion dollars on the greatest gamble in history—and won,' the President said.

The most simple explanation of the terrific explosive that is North America's top secret weapon is that scientists have harnessed the power of the sun and sealed it into the 'atom bomb.'

The sun's power is its heat, but it does not come from ordinary combustion, as in a simple fire. In ordinary fire, molecules of fuel, subjected to heat, come apart, and this action releases energy which appears as heat, light, and other rays. The sun would have burned out millions of years ago if this were its only combustion. Its great energy—heat, light, and other rays—comes from the separation of the atoms which are the smallest parts of an element that can exist and which make up the molecules, and from the shattering of the atoms themselves, which releases infinitely greater amounts of heat and energy than ordinary molecule combustion.

Scientists have known for generations that if all the atoms in a solid body or even a quantity of gas the size of a pea were to disintegrate simultaneously incalculable power would be produced.

Scientists have pursued 'atom smashing'—attempting to duplicate what happens on the sun—for many years, but it was not until the last decade that they found a substance on earth whose atoms they could actually split apart. The official announcement that uranium is the basic material of the atomic bomb gives the clue to what the bomb is and how it operates.

Uranium was first isolated in 1789 and named after Herschel's discovery of the planet Uranus. Half a century later, scientists discovered that what was thought to be uranium in 1789 was in reality uranium oxide. Minute quantities of the pure element eventually were obtained, and from this the scientists of the 20th century deduced that uranium had an atomic weight of 238—that is 238 times heavier than the element hydrogen, which has an atomic weight of one.

In the early 1930's Enrico Fermi, Italian physicist, who is now at the University of Chicago, discovered that uranium bombarded

by powerful electronic and atom rays produced a metal chemically the same but with different characteristics. His discovery led to the isolation of uranium 235, which apparently is the basis of North America's new atomic bomb. U-235, as it is commonly called, is an isotype of uranium. It has the same chemical properties but differs in atomic weight, being just three index points lighter.

In other world-famous laboratories physicists went to work and for nearly 10 years got nowhere. They could not verify the new element. They got out of their experiments a number of chemical elements of a mass, or weight, about half way between hydrogen, lightest element, and uranium, the most massive.

Then, just as World War II was beginning, Lize Meitner, a German Jewish mathematician, made a clever calculation. She said that if the experiments were splitting an atom of uranium about in two equal parts, the enigma could be explained. She proved her point mathematically.

Dr. Niels Bohr, Danish physicist, who afterward escaped the Nazis to bring his atomic experiments to England and the United States, learned of Dr. Meitner's calculations. He broadcast them. Inside two weeks the physicists of Columbia University, Carnegie Institute, of Washington, John Hopkins, and other places, and of England and France had made the test and proved the German woman right.

Early in 1940, the task of isolating even an infinitesimal drop of the substance in pure form appeared hopeless. Toward the end of February, a minute fraction of a gram was isolated at the University of Minnesota physics department, directed by Prof. Alfred O. Nier.

The sample was rushed to Columbia University. Prof. John R. Dunning, who led the research team developing U-235, and Drs. E. T. Booth and Aristid V. Crosse submitted the sample to tests with Columbia's 150-ton cyclotron.

About the same time at the General Electric laboratories Drs. K. H. Kingdon and H. C. Pollock set up an apparatus similar to that of Prof. Nier. They separated a relatively large sample of U-235. This was submitted to the Columbia laboratory and corroborated the results obtained from the Minnesota sample.

The scientists found that when

a quantity of ordinary U-238 uranium was subjected to the bombardment of neutrons, which are particles of matter consisting of a proton and an electron closely bonded but with no electrical charge, very little energy was released. But when the new, rare U-235 was placed in the great machine, the oscilloscope screens and meters danced with amazing activity. They computed that each splitting atom of U-235 released 200 million electron volts of energy.

Translated into common terms this means that the energy released by one gram of U-235, which is about three one-hundredths of an ounce, equals about 11,700 kilowatt hours of electricity, or about five million times the energy produced by burning an equal weight of coal.

As an explosive, James R. Newman in his book, **Tools of War** (1943), estimated that one gram of pure uranium 235 is 10 billion times as effective as one gram of TNT.

Furthermore, the scientists found that it was not the high-speed neutrons produced by the cyclotron which shattered the atoms of U-235, but slow-speed neutrons, such as are thrown off in the ordinary atmosphere of the earth by cosmic rays and common radio-active materials. This meant that while the cyclotron led to the discovery of uranium's amazing qualities it was not necessary to haul around any gigantic cyclotrons to ignite it in war or in peace.

At a meeting in New York in 1940, a group of scientists reported that this is what happens in the splitting of U-235's atoms (New York **Times,** May 5, 1940): There are 2,500 billion billion atoms in a gram of U-235. Each split of one atom releases 200 million volts of atomic binding-energy. The continuing split or 'chain reaction' of additional atoms by the neutrons released in the previous split is what gives U-235 its terrific power.

The scientists also stated that the 'burning' or explosive action of U-235 could be tempered by mixing it with larger proportions of regular U-238 uranium, the atoms of which cannot be split.

Emilio Segre, of the radiation laboratory of the University of California, reported in the **Encyclopedia Americana** (1943), that 'a good analogy to what occurs in uranium is a liquid vibrating drop.'

'If the amplitude of the vibration is increased beyond certain limits,' he wrote, 'the droplet splits into two fragments of approximately equal size. The atomic nucleus has some properties resembling those of a liquid drop, and the capture of a neutron, in the case of uranium, sets up violent vibrations which may lead to fission (splitting of the atom).

'The two fragments repel each other violently because of their electrical charges and a comparatively large amount of energy is released in each fission process. If we consider the possibility of disintegrating uranium on a microscopic scale, we come to staggering figures for the energy released.

'. . . It is obviously an extremely important question, from the practical point of view as well as that of the scientific investigator, to find a method of releasing the fission energy of uranium. In principle there is a simple method for doing this: In each fission process a few neutrons are emitted when the two big fragments fly apart. If these could be used to produce further fission, the process would go on and be self-sustaining until all the uranium has undergone fission. . .'

When the atomic bomb struck Hiroshima, this is what happened: Uranium inside it was disintegrated by electrical means, and atoms dissolved into millions of particles, each moving at the speed of light, that is, 186,000 miles per second. The impact of such explosive force would generate incredibly intense heat. Bricks, steel, and concrete would be melted in a second and even soil itself would be destroyed by the fiery blast of unexampled power. Not a single human being would be left alive within a radius of miles, for the air blast alone knocks people off their feet at a distance 20 times as great as that for ordinary bombs.

Sir John Anderson, who supervised the research in England, says that the temperature generated by disintegration of the uranium bomb is probably higher than that in the center of the sun. Sand on the ground is turned into glass by the terrific heat when the bomb bursts.

Uranium is a lustrous white metallic element which does not exist in pure form in nature but comes from pitchblende, in the source of radium, or carnotite, a canary-yellow mineral found in

sandstone.

Pitchblende deposits were discovered in 1930 at Great Bear Lake. There are both pitchblende and carnotite deposits in the United States. There is pitchblende in Britain, Austria, Russia, Sweden, and Norway. There is carnotite in Australia and Portugal.

One of the scientists who helped create the bomb, Dr. H. A. Wilson, professor of physics at Rice Institute, has advocated that 'some international authority should take control of the world's uranium supply to see that the mastery of the destructive principle of atomic disintegration does not fall into the wrong hands.'

What are the social consequences of this technological development in war and in peace?

In war—according to scientifically minded military men—armies, navies, and air forces have 'metaphorically been sunk in rubble and dust at Hiroshima.' (Gen. Carl A. Spaatz, United States Pacific aerial commander, has termed the new bomb 'the most revolutionary development in the history of the world.') Some are even going so far as to say that 'strategy will be unnecessary in future wars, for victory will depend on technicians alone.'

Writing in the Chicago **Daily News,** William H. Stoneman has stated: 'It is now evident that uranium explosives used in rockets and other guided missiles will make practically every weapon used until now look like a toothpick. It is suggested that great missiles of this type, employing a combination of uranium and heavy water as fuel and using uranium explosives in war heads, will be capable of destroying vast areas at a range equivalent to the circumference of the globe.'

The London **Times** has editorialized as follows: 'Science itself is neutral in the use of the vast power with which it has endowed mankind. It aspires to control the mighty forces of nature. But nations bent on war seek to make science their ally by enlisting men of science in their service. As the men of science, they seek only the truth, but as patriots in the hour of their country's danger they are legitimitely called upon to deflect their researches as policy and strategy require . . .

'The fact that war in the future will be plainly suicidal will not prevent men from waging it. Consequently, so terrible a power must be brought under responsible control. If this can be done,

then before future generations will open up unimaginable vistas of material progress.

'The choice is literally one of life or death.'

The human animal cowers back from his glimpse of the future, bewildered by his dreadful dilemma. He wonders if science has put in the hands of man at last what he has so long heard about —but never thought would leave **Amazing Stories** or the Flash Gordon comic strips—the instrument of his own destruction.

Most scientists interviewed regarding the new development have cautiously stated that it may be a considerable period of years before the new power can be harnessed for peacetime use. However, the Duke de Brogile, an eminent French physicist, has said that the energy released by the invention 'seems to be destined fairly soon to replace coal and water power and to become the motive power of tomorrow.' He thought that it could only be compared to the discovery of fire by primitive man.

Some scientists see the development as the first step toward telephone booth-size heating plants for great factories and 1000-hour auto trips on one gram of fuel. At the meeting in New York in 1940 (mentioned previously), scientists estimated that a block of five pounds of U-235, placed in a tank into which cold water flowed would produce enough steam to drive an ocean liner indefinitely over the seas of the world. The atoms of U-235, the scientists said, would not split until the water reached the block because the hydrogen atoms in the water slow down the neutrons to a speed which is effective against the U-235 atom. The heat from this released energy would produce steam and all that would be necessary to control the quantity of steam would be to regulate the flow of cold water.

The well-known London correspondent A. C. Cummings, says of the peace potentialities of atomic energy: 'It makes scientists' wildest dreams come true, for it places unlimited power at mankind's disposal. Coal mining will become obsolete, electrical power plants unnecessary, gasoline-driven automobiles out of date. The Queen Marys of the future may cross the Atlantic by the release of the energy in a single glass of water.

'Huge factories can be supplied with power from a unit of a few

square yards. Cities can be lit, provided with traction, and run by machinery at a cost that now appears fantastically low.

'All this is not scientific romancing, but plain unadorned scientific possibility.'

Politicians, economists, and business men are gasping at the news. Coal, oil, gas, and hydro-electric companies are anxiously assessing the possibilities. The public is thinking alternately about unemployment and a shorter work week.

William H. Stoneman has commented in the Chicago **Daily News**: 'The whole course of human relationships will ultimately be affected in drastic fashion by atomic power. With further developments, which may be accomplished well within our lifetime, sufficient cheap energy will be available to replace the productivity of countless millions of people.

'Revolutionary methods will have to be adopted to prevent unemployment and stagnation from resulting.

'Thus social science will be confronted with a problem as great as that solved, or in the process of being solved, by physical science.'

What is the reaction of Technocracy to the new discovery? What is its social significance in peacetime from the Technocratic point of view?

To Technocracy, the utilization of atomic power is the latest and greatest item in a long sequence of physical events which have been transforming this planet, particularly the North American Continent, during the last 150 years.

Technocracy has been studying the social impact of every scientific invention and technological advancement for the past quarter of a century. It has consistently pointed out that social institutions were lagging far behind physical developments. It made a scientific survey of the social effect of the consumption of extraneous (non-human) energy which indicated that when North America consumed 200,000 kilogram calories per capita per day (in peacetime) the present Price System could no longer operate.

North America was rapidly approaching that limit when World War II burst upon this planet. By dissipating vast amounts of extraneous energy on the battle-fronts, the war made it possible for the Price System to survive.

But under the technological impact of total war this Continent stepped up its energy conversion to such an extent that we can now produce more than twice the goods—with half the men—than we did before the war. Even without atomic energy, the rate of conversion from North America's coal, oil, gas, and falling water would have made a complete change in our social control technic imperative and inevitable.

When the social mechanism of a Continental area steps up its energy conversion factor the goods and services that pour out in a flood must be consumed or destroyed. Under a Price System at peace they cannot be consumed because increasing use of extraneous energy has decreased purchasing power in displacing man-hours. The paradox of the Price System can thus be stated as 'the more we can produce, the less we can consume.'

North America is, therefore, faced with the problem of making revolutionary changes in her social system. Here are some of the major social changes that even our present technology will make necessary, and which use of atomic energy would make absolutely imperative:

1. Technological control over all natural resources and physical equipment.

2. A metrical medium of distribution based on an energy unit instead of a monetary medium of exchange based on value.

3. A work week that will shorten as more extraneous energy is utilized.

Every technological advance has been a bomb disintegrating the Price System structure. But to the average person it has been a comparatively slow and unspectacular process. Then, with the impact of the sun bomb, millions of citizens in dazzling flash have seen the black mountains of technological unemployment in the postwar period.

In the midst of the chaos and confusion caused by clinging to Price System methods in the Power Age, Technocracy goes calmly about its task, the only Organization in North America that is preparing to use scientific discoveries for the social welfare of mankind. Technocracy alone offers the scientists, technologists, and engineers an opportunity to do what most of them have always wanted to do: utilize our physical

equipment and energy resources efficiently so as to provide every citizen with security, abundance, and leisure.

Shortly after the end of World War I, H. G. Wells stated succinctly that man's problem was 'a race between education and catastrophe.' North Americans, which are you betting on as they come down the home stretch?

—Donald Bruce

★ COULEE DAM, Wash., August 22—Power equal to the work performed by 8,000,000 men laboring steadily for 10 years was turned out by Grand Coulee Dam during the war, the Bureau of Reclamation announced today in telling how the world's greatest dam helped speed victory.

From the time that the first generator went into production on March 22, 1941, several months before Pearl Harbor, to the surrender of Japan on August 14, the power plant at Grand Coulee Dam turned out 15,767,474,000 kilowatt-hours of energy, said Regional Director Frank A. Banks of Reclamation. Great blocks of this power went to the famed atomic bomb plant at Hanford, Wash.

Translated into weapons of war, this production of more than 15 billion kilowatt-hours would equal 38,000 fighter planes, nearly 25,000 heavy bombers, or 70 first-line battleships costing $80,000,000 each, Banks explained.

When the Japanese struck at Pearl Harbor, Grand Coulee Dam had only one of its massive 108,000 kilowatt generators and two small station service units in action. Today it has six of the 108,000's plus two smaller units of 75,000 kilowatts each which originally were intended for the Bureau's Shasta Dam in California. Government employees worked night and day, month after month, to hasten the installation of Grand Coulee's generators to serve major war plants in the Pacific Northwest.

Grand Coulee's war role recently received world-wide recognition when Army representatives stated that the availability of huge quantities of electrical energy provided by Grand Coulee Dam and Bonneville Dam helped make possible the production of the atomic bomb at Hanford. With its fellow plant on the Columbia River, the Grand Coulee power plant sent a steady steam of energy into transmission lines serving the secret project in southeastern Washington and thus enabled the United States to develop the most powerful weapon known.

★ IT IS QUITE TRUE that many of the world's ills may be traced back to changes introduced by technology. Our economic structure was not designed for today's production mechanism. No problems will be solved, however, by touching pleas for a return to the simple things of life. We can't put the clock back. Those who insist that it can be done usually arouse the suspicion that they are thinking in terms of an authoritarian state. —Joseph Mindel in *Tomorrow*

★ THE ESSENCE OF OUR INABILITY to cope with the problems raised by technology lies in an attitude of exaggerated laissez-faire. It is not that controls have failed but simply that they have not been applied. Our attempts at controls have a Victorian quaintness, charming, perhaps, in a period piece, but utterly out of place in the twentieth-century world. —Joseph Mindel in *Tomorrow*

Science in the Social Field

With World War II at an end the business man's paradise of almost universal scarcity begins to fade before a looming nightmare of over-loaded warehouses and mass unemployment. It now becomes increasingly apparent that the problem of distribution can be solved only by a unified application of science to the social order.

WE are often told that we live in a scientific age. In the sense that we are dependent on applied science for the production and transportation of goods this claim is perhaps correct enough. However, while the methods of science and engineering are applied to the details of industry, the methods used in the over-all management of society—insofar as there is any management—are a hodge-podge of business expediency, legal tradition, pressure group jockeying, and departmental political bureaucracy. The scientist and the technologist are still, in this fifth decade of the Twentieth Century, the hirelings of business men and politicians; they are subject to a dictatorship of moneyed interests, the main objective of which (from the business man's point of view) is more and more business with higher profits, and (from the politician's point of view) maintenance of the status quo with as little social change as possible.

The word 'science' itself has been kicked around so much that it has become almost meaningless —just a word that generally suggests test tubes and laboratories and weird-looking formulas. The universities, being citadels of tradition and repositories of dated ideas, still palm off on our unsuspecting youth as science much that should be relegated to the classification of academic folklore and forgotten: most of their economics and 'political science,' for instance, and much of their psychology. (As a side-light, we might note that this perennial hoax is financed largely out of our taxes). Carl Dreher, in his challenging book, **The Coming Showdown,** says, 'We are supposed to be imbued nowadays with the hardheaded, matter-of-fact spirit of science and technology, but it seems to me that much of what is offered in the field of science and political analysis is es-

sentially a kind of modern scholasticism, bearing no discernible relation to the world of reality and offering no intelligible prescription to those engaged in concrete problems.'

Technocracy proposes that the methods of science be applied to all the major phases of social operation. This proposal provides a short definition of Technocracy: 'Science applied to the social order.' We are not concerned with science merely as a system of ideas on which to practise our mental powers, or as part of the stock-in-trade of the would-be 'intelligent person,' but as a methodology of social management, a way of doing things on a national or continental scale, a way of arriving at decisions in the social field.

The method of the scientist and technologist in solving problems is very different from the methods—or should we say, habits—of politicians, business men, mystics and lawyers, to name only a few. For example, if a technologist is faced with the problem of designing a cable for a suspension bridge he has to make a number of decisions as to size, length, materials, whether to use a single strand of solid metal or a wire rope or a tube, and so on. He does not solve the problem by submitting it to a vote of the general citizenry, as would the democratic politician; he does not solve it by deciding which way will make the most money, as would the business man; he does not go into a trance or a prolonged fast to induce visions, as would the mystic; he does not pore over old books to find the answer in a pronouncement by someone in a high position, as would the lawyer. No, his decision is based on the requirements of the job and the physical factors involved. He measures very accurately the length of span required; he knows what weight his bridge is required to bear and what wind stresses it must sustain. He calculates what tensile strength his cable will have to have; he finds out what materials are available. Then, making allowances for all the physical factors that enter into the problem, he decides on a certain size and design of steel cable.

Enlarging the scope of our example to take in the whole bridge, the problem then is how most efficiently to build a structure that will sustain a certain weight of mobile traffic under all condi-

tions of climate that obtain in the locality. Every detail of the design, down to the size of bolts holding the gusset plates, is determined by its relation to the whole; and, moreover, the requirements in each case can be stated in so many units of measurement.

If we enlarge the problem still further to take in a whole national transportation system the same general procedure can be followed out. That is, we decide what the over-all requirements of the job are (just as we might decide that a bridge should be required to carry a load of 160 tons under stated conditions); then we design our system with these basic requirements as the dominant criteria for deciding the design of each individual detail. The reason this method is used in the world of technology is simply that it works, where other methods fail. If oil companies could reliably decide where to drill for oil by employing diviners or Hindu swamis they would certainly do so, in preference to using intricate and expensive seismographic survey equipment and drilling test holes at a quarter of a million dollars or more per hole.

As individuals, scientists are as different personally as any other grouping of human beings. Take a few at random—Darwin, Helmholtz, J. B. S. Haldane, Madame Curie, Steinmetz, Einstein—and you have as wide a variety of personal temperaments as if you named off-hand half a dozen Hollywood actors or mayors of New York. But the work of the scientists is divorced from their individual preferences and notions; however their personal characteristics may differ, their methods follow a general pattern, not as a matter of tradition but as a necessity.

First, the scientist or technologist, whether in the laboratory or in the 'field,' collects the facts relative to his problem. It is important that he should get **all** the facts available. He knows that if he omits any important fact in his investigations his conclusions will be wrong, and he can probably call to mind several cases where such omissions have led to failure or even disaster. He knows, for instance, that the presence of mosquitoes in Panama were an important factor in the history of the construction of the Panama Canal—as de Lesseps learned to his cost.

Much of the accumulation of

facts can be gained indirectly; that is, the facts have already been established. The bridge designer can find the shearing strentgh of a ¾ inch rivet from a steel catalogue without personally conducting tests; the hydraulic engineer can find by consulting a table that a head of 300 feet will produce a hydrostatic pressure of 130 pounds. Many problems can be solved without any direct investigation, because the engineer and scientist have a vast heritage of accumulated knowledge stored in technical books and periodicals. Any facts not obtainable from such sources must be established by observation and experiment.

Having collected all the relative data he can, the technologist then makes his analysis of the problem, which may take the form of a written report. On the basis of this he makes his synthesis, or in more familiar terms he decides how he is going to do the job and draws up his plans and specifications. But that's not the end of his job. Construction work or fabrication begins, in the course of which he may have a number of operational problems to solve, as when a tunnelling project runs into unexpected quicksand or a seam of unusually hard rock. And then, in such processes as machine manufacture or airplane construction there is the task of working out the 'bugs,' which is sometimes a long drawn-out affair.

It should be noted that the operations we are considering are mostly matters of measurement. Moreover, the measurements are all expressed in non-variable units. A pound weight has a very exact meaning and does not fluctuate with a change from a Liberal to a Conservative government. There may be inflation of the pound Sterling but there is no inflation of the pound weight. The length of a metre was established in 1799 and has been exactly the same ever since and will be the same a thousand years from now. This non-varying character of units of measurement is an indispensable prerequisite of science. It automatically excludes from the field of science such mental pursuits as philosophy and economics, important as these may be as phases of the mental gymnastics of the traditionally 'well educated' person.

Commerce is based on monetary values, which are expressed in dollars; but what a dollar is

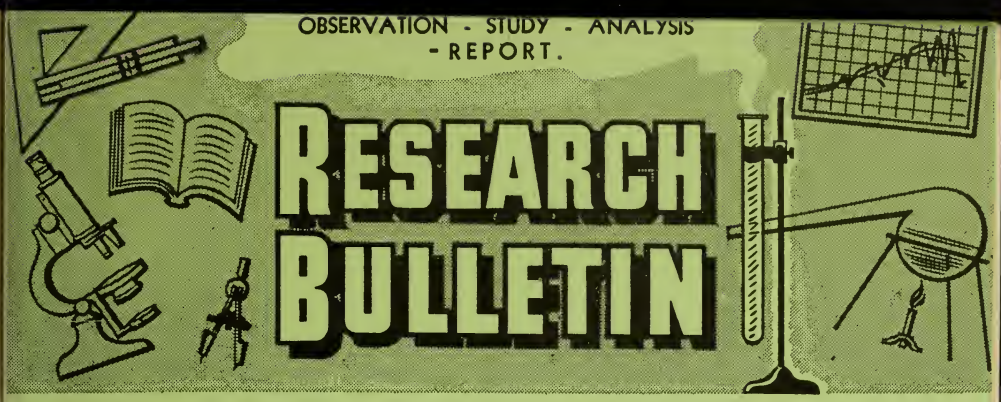
has never been quantitatively defined, and never can be. Consequently the monetary value of anything can never be established: it remains forever in a vague never-never land in whose insubstantial atmosphere the scientist cannot live—as a scientist.

Pick up a simple object such as a brass ash tray and send it to the National Research Council for investigation. They can give you a lot of information about it: its weight, metallurgical composition, electrical conductivity, coefficient of expansion, specific heat, and many other properties, each of them expressed in a certain number of this or that non-variable unit. But ask them the value of it and they are lost. Even if you sent it to the Department of Economics at a university, the professors could not hazard a guess about it until you told them whether you meant its value today or four years ago or forty years ago, whether you meant in an Eskimo village in Labrador or a department store in Montreal or a scrap metal agency in Moose Jaw or in Berlin in September, 1923. It is notable that in the ascertaining of the physical properties of our ash tray it doesn't matter whether we send it to Russian scientists in Moscow or to the University of Cambridge or the Bureau of Standards in Washington. We would get the same answers in each case; and if we repeat the investigation twenty years from now we will still get the same quantitative data for each property.

The world of the scientist is the objective world. He looks outward, not inward. As an individual he may have other interests which come within the range of the subjective. Sir Oliver Lodge, an eminent physicist, was perhaps best known to the public as a spiritualist. Mendel spent most of his life in monasteries. Eve Curie's biography of her mother gives us a rich warm story of a young girl, an affectionate wife and mother, as well as recording the career of a great investigator of the phenomena of radio-activity.

Still, as scientists, each of these was concerned with the objective world of reality, a world in which statements can be verified or rejected by reference only to phenomena which can be measured in some way. Max Planck, the great authority on thermodynam-

(Continued on Page Thirty-five)



SEPTEMBER, 1945 Compiled by Editorial Staff No. 32

The Story of Pulp and Paper

PAPER manufacturing began in Canada early in the past century. The first mill in Lower Canada was established at St. Andrews, near Lachute, in 1803, and the second in the county of Portneuf in 1810. The Maritime Provinces entered the industry in 1819 with a mill built at a little distance from Bedford Basin, near Halifax. The first mill in Upper Canada was located at Crooks Hollow (now Greensville) near Hamilton, but the date is uncertain, being set by some at 1813 and by others at 1820 and 1825. At the census of 1851 Upper and Lower Canada had five mills each, and ten years later Lower Canada had six and Upper Canada five.

Until Confederation the industry was confined to the manufacture of paper from rags. Prior to 1860 no wood-pulp was used or produced anywhere. The supply of rags for paper-making is distinctly limited and the material soon became too expensive for the manufacture of cheap paper. Paper-makers experimented with fibres from the stems, leaves and other parts of numerous annual plants; but the small proportion of paper-making material recoverable from such sources led to experiments in the use of wood. Different species were tried, and finally spruce, balsam and hemlock were found to

be the most suitable for manufacture of paper of the average grades, although in recent years increasing quantities of jackpine and poplar are used. Rags are still used for certain fine papers.

In 1886 Alexander Buntin installed at Valleyfield, Quebec, what is claimed to have been the first wood grinder in America and began the manufacture of wood-pulp by the mechanical process. About the same time Jacob Thomson was successful in his experiments to manufacture paper from wood by using caustic soda to dissolve the non-cellulose components, and his employers built the first chemical wood-pulp mill in Canada at nearby Windsor Mills, where production began in 1869.

These two pulp-mills, however, are not mentioned in the census of 1871, which covers only the 21 paper mills in operation, 12 located in Ontario, 7 in Quebec and one each in New Brunswick and Nova Scotia. These paper mills had 760 employees, distributed $197,815 in wages and salaries and produced paper valued at $1,071,651. Ten years later, in 1881, there were 36 paper and 5 pulp-mills in operation with a total of 1,588 employees, a pay-roll of $460,476 and an output valued at $2,509,993 consisting of pulp valued at $63,000 and paper valued at $2,446,693.

During the next decade the use of wood-pulp in paper-making was extensively developed and in 1887 Charles Riordan installed the first sulphite mill in Canada at Merritton in the Niagara Peninsula. The census of 1891 shows only a slight increase in paper production, but the number of pulp-mills had grown to 24, of which 17 were located in Quebec, 3 in Ontario, 2 in Nova Scotia and one each in New Brunswick and British Columbia, and the annual value of the products amounted to $1,057,810. Although one pulp-mill was credited to British Columbia, it was not until 1909 that pulp was manufactured from wood in that province; however, a paper-mill using rags imported from Great Britain was operated near Alberni from 1894 to 1896.

At the beginning of the present century the output of the pulp and paper industry of Canada exceeded eight million dollars. From then until the end of the first Great War the industry increased rapidly and steadily. In 1907, the Brompton Pulp and Paper Com-

pany built at East Angus, in the Eastern Townships, the first mill in America to produce chemical pulp by the sulphate or kraft process. Many new pulp and paper-mills began operations in the Maritime Provinces, Quebec, Ontario and British Columbia.

It was during this period that the paper industry began specializing in the production of newsprint. Reduction of the American tariff on newsprint in 1909 and a few years later the removal of all duties on this commodity hastened the migration of the American newsprint industry to Canada. In 1918 production of the pulp and paper industry reached well over 100 million dollars.

Following abolition of price control, imposed toward the end of the first Great War, the price of pulp almost doubled, and the gross output of the industry reached a peak of $236,420,176 in 1920. From 1922 to 1929 there were steady annual increases in the total value of production culminating in 1929 in a figure of $243,970,761. There were annual reductions during the next four years, but the output rose again to $208,152,295 in 1939. In that year there were 27 mills making pulp only, 49 combined pulp and paper-mills and 24 manufacturing paper only, a total of 100 mills.

Besides the many new mills built during the 1939 period, most of the older ones added new paper machines, grinders and digesters and other equipment. In 1939 the pulp and paper industry had a daily capacity of 12,956 tons of groundwood pulp, 6,800 tons of chemical pulp, and 14,714 tons of paper. In 1939 the pulp and paper industry occupied first place among all manufacturing industries in Canada in respect of amount of capital employed and amount of salaries and wages paid. In number of employees and gross value of production it stood second to the sawmilling industry, and the non-ferrous metal, smelting and refining industries respectively.

During the earlier years of the present war the manufacture of wood-pulp and paper increased by leaps and bounds. The exceptional demand for pulp made necessary the installation of additional manufacturing facilities. In 1940 and again in 1941 both volume and value of production exceeded all previous levels. In 1942 and 1943 the gross value of products increased still more, but the volume of pulp and paper produced was somewhat lower than in 1941. Two factors

accounted for this decrease in production: the urgent need for men for war industries and the armed services reduced the supply of manpower available for cutting pulpwood in the forests; and the production of munitions and other war materials necessitated the diversion to new war plants in eastern Canada, and in New York State, of part of the hydro-electric power used in pulp and paper manufacture and the consequent reduction of the output of certain mills.

Despite these handicaps the Canadian pulp and paper industry supplied to the United Nations tremendous quantities of pulp, paper, and pulp and paper products, so essential for the successful prosecution of the war. The use of the products of this industry for direct war purposes may be less obvious than in some other cases, but they are many and varied.

Wood-pulp is used extensively in the production of high explosives, such as cordite and gun cotton, replacing cotton linters at about half the cost. From the same wood, cellulose surgical dressings and hospital wadding are made to heal the wounds of the soldier. The so-called 'dissolving' pulps are also transformed into rayon, celanese, cellophane and pulp-based plastics from which are produced synthetic yarns for tires and parachutes, gas-impervious clothing, impervious wrappings for intricate machines, wrappings for perishable drugs, chemicals and food, housings for radio, aircraft, artillery and navy instruments, etc., replacing cotton, silk and metals.

Paperboard is used in containers for shell cases, ammunition, gun barrels, machine parts, blood plasma, food and medical supplies, replacing metal and wood. Building board or wallboard replaces lumber in the construction of barracks, hospitals and other temporary buildings and for the finishing of ships, ambulances and aircraft.

Certain paper products are component parts of sea and land mines, of radio equipment, of shells and other weapons of war. Multiwall kraft paper sacks have replaced jute sacks in many instances. It takes three acres of blue-print paper to put into production a single bomber type of aircraft. The armed forces and the munitions industries require much paper for administrative use.

Newsprint is indispensable for the dissemination of information, and the maintenance of a free press in over forty countries has de-

pended chiefly on the output of Canadian newsprint mills. Millions of leaflets were dropped on the enslaved countries of Europe. Large quantities of papers are required for the production of ration books, Victory Bonds, War Savings Certificates, etc., etc. Other kinds of paper, such as wrapping paper, tissues and special grades are also essential.

A special contribution to the general war effort was made by the pulp and paper industry by the adoption of a program of 'bits and pieces' in its extensive and well-equipped machine shops, and the diversified list of products made includes parts for naval and cargo vessels, aeroplanes and gun-mountings, as well as gauges and other special devices. During the first year supplies produced were valued at more than $1,250,000, and subsequent production has been much greater, the amount received for such work in 1943 reaching $2,012,165, which represents only a fraction of the value of the finished products, most of the materials used being supplied by the customer.

In the early years Canada exported the products of her forests in the raw state, but through the development of her own mills and the use of new processing methods, the great bulk of Canada's forest exports, particularly in the line of pulp-wood and paper, became fully manufactured. In 1943 the United States took 78% of bleached sulphite exports; 82.3% of sulphate pulp; 80.8% of mechanical pulp; 97.9% of screenings, and all the other pulp. Other countries which have figured in Canadian exports are the United Kingdom, Brazil, Mexico, Australia, Columbia, Peru, Portugal, Eire, Uruguay, and the British West Indies.

The importation of paper is relatively unimportant in comparison with exports but it is far from being an inconsiderable item. It amounts to $7,520,328 in 1938 and to $10,701,736 in 1943, forming about 6.7% of the value of the exports of paper in both years. The United States provided practically all such imports in 1943. The greater part of her importation is made up of paper, paperboard or paper goods which have been subjected to some special process to fit them for a special purpose or consists of finished products manufactured from paper or paperboard.

Almost every class of paper or paper goods at present imported

into Canada is being made in this country or could be made with comparatively little change in the equipment existing in our paper-mills and the plants of our paper-using industries, providing there were sufficient demand to warrant such manufacture.

Canada possesses abundant supplies of the raw material on which the pulp and paper industry depends. The forested area of Canada, estimated at 1,220,405 square miles, is exceeded only by the forests of the Union of Soviet Socialist Republics and of Brazil. The productive area alone is given as 770,565 square miles.

According to the latest calculations of the Dominion Forest Service, the total stand of timber in Canada comprises 1,941,076,000 cords of small coniferous material, a large part of which is suitable for making into pulpwood. Of this total 1,082,879,000 cords are at present accessible. The Eastern Provinces, in which the pulp and paper industry is concentrated, account for 803,128,000 cords of this small material and British Columbia is credited for 186,286,000 cords.

If wise policies are adopted to reduce wastage through fires, insects and tree diseases, and to encourage good forest management in general, the Canadian forests can provide the raw material for large-scale production of pulp, paper and related products in perpetuity.

This country's position in the matter of hydro-electric power, which is also essential for the success of the pulp and paper industry, is just as favourable. Available waterpower at ordinary minimum flow was estimated at 25,439,000 h.p. as of December 1943; at that same date, the total turbine installation amounted to only 10,214,513 h.p. The pulp and paper industry is already the largest user of hydro-electric power in Canada; before the war it consumed about 40% of the total for all Canadian manufacturing industries. Should the industry's requirements increase, there are still large sources of power to draw from.

Not only is Canada endowed with tremendous forest reserves and huge hydro-electric resources, it also has a well-organized industry to utilize these riches. The pulp and paper-mills of Canada are advantageously located across the country, near both Pacific and Atlantic seaboards, and consequently are in a position to make economical deliveries to any part of the world. In 1943 these mills had a daily

capacity of 7,599 tons of chemical pulp, 13,414 tons of mechanical pulp, 15,465 tons of newsprint and other paper and 1,722 tons of paperboard. **—Dominion Bureau of Statistics**

EDITOR'S NOTE: *A modern social system directed by scientific and technological control will change the status of the present pulp and paper industry.*

Technology Revolutionizes Farming

IN THIS article, a few of the more outstanding achievements of farm industrial enterprise are touched on, some of the plans for tomorrow dealt with. Both are of almost revolutionary magnitude.

Here is what has happened to output per man on the Canadian farm — and this includes all types of farm operation, not just the harvesting advances dramatized on the next page. The index was compiled by Dr. E. C. Hope, formerly of Saskatchewan University.

Index of Farm Output Per Man

1921	66.7
1928	84.8
1931	71.6
1939	105.4
1942	167.5

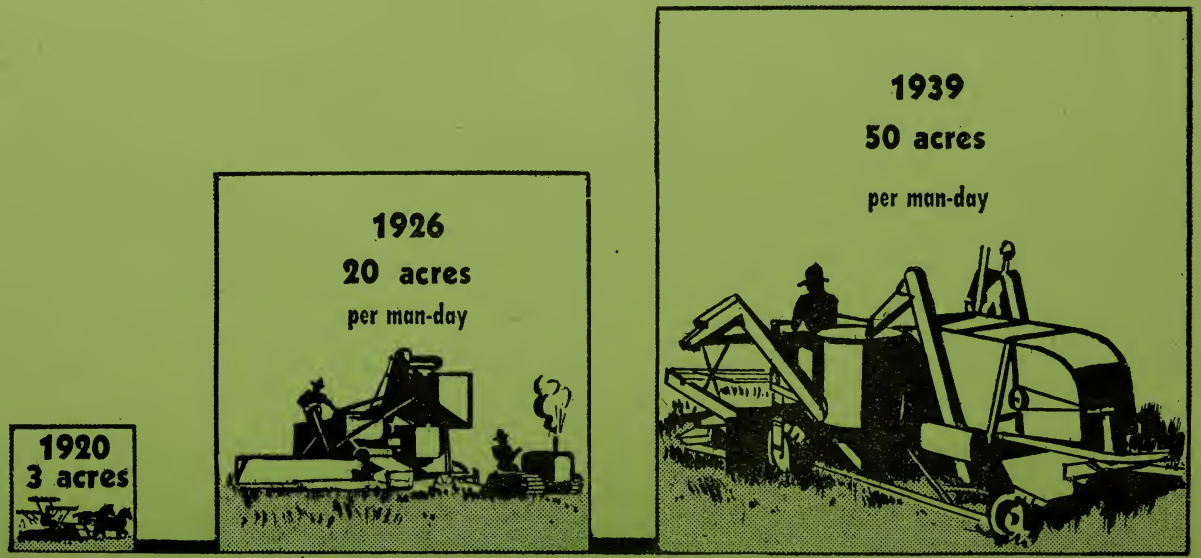
The first 20-point jump coincides pretty generally with the introduction of the tractor-drawn combine; the last 62-point rise reflects the effective use of farm manpower after about 400,000 farm workers went to the armed forces and war industry. Again, a major part of the story was broader use of machines.

In the illustration (on the next page) is told the story of the mechanization of the harvest, on large-scale grain farms. This 16-fold increase in efficiency is the most dramatic aspect but the effects of mechanization are wide-spread. Some examples:

Milking: a hand milker milks 7-9 cows an hour; with a milking

Technology Boosts Farm Output

—In 19 short years the daily output of a man on a farm has increased to about 17 times what it was. Here is the daily output of a harvester: first, as part of a team which reaps, binds, stooks and threshes in three operations with the aid of horses and a tractor; second, working with another man and a tractor-drawn combine, which reaps and threshes in one operation; third, driving one of the new improved, self-propelled combines. Figures refer to acreage harvested per man in a 10-hour day by each method.



machine he does 20.

Corn-husking: by hand, 6½ hours for an acre; with a one-row picker, 1⅛ hours.

Sugar Beets: (blocking, thinning, lifting, topping, loading); by hand, 72 hours per acre; with a machine, 12 hours.

Transplanting Sweet Potatoes: by hand, 42 man-hours for an acre; with a transplanter 10.

But in spite of past advances, experts say the possibilities of increasing labor efficiency in agriculture are still vast. The farm implement industry is gearing up for an accelerated increase in the use of power machinery, as supplies become available.

What's ahead in the line of farm machinery? Weight and durability have already been greatly improved. But through heat treatment of steels and other alloys, through the use of plastics through exploration of the effect of grain structure and fibre and how it must be handled to get the greatest use from the smallest amount of various materials — greater strength and lightness are expected.

Comfort and appearance will rate more attention in the post-war world; easier operation and noise reduction are under study; streamlining and color innovations are in the wind. But these considerations will still run second to greater efficiency and more speed — the kind of improvements that reduce the farmer's cost of production. By study with farmers under actual conditions engineers are learning more and more about what the farmer really wants and needs.

'Integration' of tractor and implements is an important trend expected to be emphasized after the war. This may be developed in two directions:

1. Through the increased use of self-propelled machines;
2. By increasing the ease and directness with which machinery or implements may be attached to the tractor. For instance there may be, on the smaller self-propelled machines, a small light-weight demountable engine so that one power unit will do for all machines.

The self-propelled combine is expected to be in great demand as soon as it is available for sale again. It was introduced a few years before the war, but had hardly got into its stride when war production took priority. It has only one engine and one operator —

therefore is said to be much more economical than the conventional tractor and combine which has an engine and operator on each. A further saving of at least half a bushel per acre in opening up fields for harvesting, is claimed for the self-propelled machine, which has no tractor in front of the cutting knives to run through the standing grain and beat it down beyond recovery.

Tractors are now owned by slightly more than a fifth of the farmers in Canada. Ownership increased over 50% between 1931 and 1941. A large new market, in addition to the replacement market, is believed to be waiting for tractors, though further adaptations may be required before tractors can be used on some of the types of operation classed as 'farms' in Canada.

Researchers expect greater power output, lower fuel consumption and generally improved engine performance from the tractor in the future — which should lower the cost of production with power machinery.

Not all the new developments are in the familiar tractor and combine. Here are some of the other new wrinkles the war-working implement and machinery industry has up its sleeve. Many more are on the drafting boards.

The forage crop harvester cuts and chops silage crops in the field and loads the chopped products into the wagon to be hauled to the silo. One of these machines does the work that would normally be required of a mower, rake and loader. It can also be used to chop and pick up combine straw.

The automatic tying pick-up hay baler, pulled by a tractor, travels along the windrows of hay, gathering it up, pressing it into bales and discharging the completed bales.

A rotary tiller is also being developed which is said to do the work of plowing, discing and harrowing in one operation.

A combination fodder-sprayer, fire-fighter, paint gun and insecticide dispenser has been proudly reported by a U.S. company recently. This machine can spray a 20-foot swathe of nourishing but unpalatable grass with a molasses solution which will lure finicky cattle into eating it with relish, according to reports. Filled with the appropriate mixture, it becomes in turn a weed or insect sprayer or a paint gun.

It can also be used to fight fires on the farm with a liquid fog.

A development which may lead to others of the same nature is a mechanical device for loading potatoes, in districts where potatoes are packed into barrels. This job used to require a four-man crew; one to drive the truck, two to lift the barrels to the truck and another to stack them. The barrels weigh around 200 lbs. and must be lifted a vertical distance of about 32 to 36 inches. With a hydraulic barrel loader mounted on a truck and operated by a gas engine, two, or at the most three, are all the workers required—and the job is a lot lighter.

Still in the development stage, but expected to get into use fairly soon, are improved machines for loading manure, cleaning stables, crop unloading, grinding. As rural electrification proceeds, the tractor-mounted diesel electric set (used freely in World War II) may be adapted to perform certain farm functions. **—Financial Post**

EDITOR'S NOTE: *Farms in the New America of science and technology—the Technate —will be agro-technological units of* 400,000 *acres or* 25 *miles square. A study of this unit is highly interesting when compared with our present farming methods.*

The Outlook for Chemicals

NO ONE would have ventured to suggest in 1918 that the huge stocks of explosives with which chemical firms were bulging would ever be anything but a liability. But when manufacturers began to look for ways to dispose of their stocks, they found, not only a solution, but a whole new industry: the manufacture of nitro-cellulose lacquers.

These new, glossy, inexpensive stepchildren of war penetrated many other industries: automotive, construction, packaging, for examples. Costs were reduced and consumer appeal heightened all along the line.

During this war, the chemical industry's expansion has been even greater; and its search for new products is even more pain-

staking. Other industries, this time realizing how vitally they may be affected by what the chemical industry does to solve its own problems, are watching the chemists closely.

This article sketches briefly some of the chemical developments most likely to affect Canadian industry after the war.

Not all of these significant developments are among the spectacular discoveries and applications that have been displayed to the public over the last 10 or 20 years, such as penicillin, sulfa drugs, plastics, vitamins, synthetic fibres, DDT, synthetic rubber.

Behind these products that touch the consumer directly are more fundamental advances without which plastics, sulfa drugs and so forth might never have been possible . . . developments that provide a general cost reduction open up whole new lines of endeavor. A leading chemist describes three of the most important of these, typical in their impact of industry as a whole, which have occurred over the last 50 years:

'They are, perhaps, disappointingly unromantic. Two of them concern sulphuric acid and nitric acid. These might be said to bear the same relationship to chemical industry that steel and concrete do to structural engineering.

'Until the development of the so-called "contact process," sulphuric acid was made in chemical plants that were large and expensive in relation to output. The more concentrated forms of sulphuric acid increasingly demanded by industry were still more expensive to produce. By the contact process sulphur dioxide and oxygen are made to combine in the presence of platinum, almost instantly, to produce sulphur trioxide. This, when dissolved in water, gives sulphuric acid. The development of this process gave industry an unlimited supply of sulphuric acid of any desired strength at low cost.

'Somewhat similar has been the story of nitric acid.

'Large deposits of nitrates in Chile were formerly the chief source of the nitric acid that chemical industry requires in great quantity. Nitrates contain nitrogen, the gas that constitutes four-fifths of the air we breathe; but formerly it was impossible to make the nitrogen of the air react chemically. Now, there are two processes by which this can be achieved: in one, it is made to react with the oxygen also

present in the air, to produce oxides of nitrogen (which when dissolved in water give nitric acid). In the other, it is made to combine with hydrogen to form ammonia. The latter may be readily transformed into nitric acid. In both of these cases and in the case of sulphuric acid also, "catalysts"—materials which by their presence speed chemical reactions—are used. This use of catalysts has, in itself, been one of the most interesting and widespread developments of the chemical industry.'

The third development chosen by this authority was the development of a language: the terms of organic chemistry, that branch from which stems all our foods, all textiles, paper, most drugs, leather, rayon, rubber, petroleum and its products. 'We can see, looking back,' he says, 'that a knowledge of how these comparatively complex chemicals are put together in nature, and the development of a system of picturing their structure and naming them, has been responsible, more than any other single factor, for the mushroom growth of their part in the science of chemistry. This has enabled materials found in nature to be duplicated in the laboratory, but—far more important—it has made possible the manufacture and development of hundreds of useful materials not found in nature.'

It is possible, according to another leading chemist, that two major Canadian industries may be revolutionized, one by a recent chemical, or rather technological, discovery, and the second by the result of our war effort. The lumber industry, he says, will undoubtedly feel the impact of the new techniques of hardening wood by plastic or chemical impregnation, and of bonding sawdust or plywood with thermo-setting resins. Soft woods may thus be used to a greater extent as building materials.

The second revolutionary development anticipated by this authority, arises directly out of the war. Our new ability to produce ammonia, sulphuric acid, phosphoric acid, greatly exceeds Canada's former consumption of these chemicals. Canadian farming is likely to benefit through lower cost fertilizers, while the pulp and paper industry will also probably be affected.

One of the first and greatest wartime expansions in Canada was in the production of ammonia, nitric acid, and ammonium nitrate.

Ammonia, if secured cheaply enough, could supplant the lime and limestone now employed as one of the chemical components for the digestion of wood to sulphite pulp. Cost is the only thing that would prevent its large scale use, but there is hope for the desired low cost in postwar years.

When the war began, Canada was producing less than 100 tons of ammonia a day. Now our production can be over 500 tons. Three large plants were built by the government, one at Niagara Falls, one at Trail and one at Calgary. The initial purpose of these plants was to supply nitric acid for nitration in various explosive processes, and for the production of ammonium nitrate (which when mixed in various proportions with TNT yields the shell and bomb-filling explosive, known as amatol).

In peacetime, ammonium nitrate is of great use, not only as a chemical for further processing, but also as a nitrogen-carrying fertilizer. Ammonium nitrate when pure contains 35% of fixed nitrogen. When properly processed with derivatives of calcium cyanamide it plays an important part in the production of valuable artificial resin bodies.

The impact of chemical developments on industries is complex, operates in several directions at once. For example, the development of plastics and the synthetics will probably have marked effects on the metallurgical and glass industries.

Taking a look at the future, one research manager says: 'Most process industries have research departments possessing many important chemical discoveries as yet undeveloped commercially. Many postwar factors, such as aggressive commercial exploitation of present discoveries, public acceptance of the products, public purchasing power and certain other factors control the rate of commercial development of new products. As present discoveries are commercialized, it is necessary for industry to spend more and more on research in order to keep their backlog of discoveries and developments sufficiently ahead of immediate requirements.'

The Department of Finance has recognized the importance of commercial research to provide a source of expansion for business today. Out of this general acceptance of research's importance has

come, however, one sentiment that rather irritates the chemist: the feeling that chemists can supply the answer to all our problems, from what to do with our wheat surplus to how to banish disease. Chemists roundly denounce such assumptions as 'sensational,' stress the years of patient effort that have brought chemical knowledge to its present pitch, stress also the major social, political and economic influences that pounce on a chemical development as it emerges from the laboratory. Chemists have pointed out, in fact, that if all further progress in scientific discoveries were stopped, and if the results already obtained could be properly applied and the results made available to humanity, a very nice approximation to the millennium might be obtained.

In spite of their desire to be cautious, to raise no hopes they cannot fulfill, many chemists will agree that from their labors may come some if not all the wonders we have learned to expect.

'One cannot, of course,' says the chairman of the chemistry department of a major Canadian university, 'say specifically what the next 10 years hold in the way of developments in chemistry that will affect our daily lives, but one trend seems clear. In the past we have taken the materials with which nature has supplied us and adapted them as best we could to our needs. These adaptations have sometimes been chemical, sometimes physical, and sometimes an adaptation of both. The products so obtained have not necessarily been exactly suited to the purposes to which they have been put. That is, in the past one has been faced with a given set of specifications and has sought the material best suited to them. In the future we may expect, within reasonable limits, that a material can be made to suit a set of specifications.' **—The Financial Post**

PRODUCTION by Canada's chemical industries reached an all-time high in 1943, according to a final summary released by the Dominion Bureau of Statistics at Ottawa. The official figures place the value of chemicals and allied products for that year at $765

millions, which is 52% more than in 1942 and more than five times the best pre-war total for this group of industries. However, a large part of this gain can be attributed to higher returns from shell-filling plants which are classed in this group in the official records. Without these works the over-all increase was about 8%, a figure which is probably much more representative of the general trend in the chemical field. Nine of the industries in the group showed higher output values than in 1942, the percentage advance being as follows: heavy chemicals, 20.3; compressed gases, 12.3; fertilizers, 28.2; medicinals, 20.9; toilet preparations, 27.1; adhesives, 23.9; polishes, 4.8; and miscellaneous, 91.8. There was a decline of 1.5% in paints, 2.9% in inks, 2.3% in wood distillation, and 3.9% in coal tar distillation, while values for soaps and cleaning preparations are practically the same as in the previous year.

In the entire group there were 945 establishments in operation, representing an investment of $759 millions in fixed and working capital and giving employment to a monthly average of 92,288 workers during the year. These firms paid out $147 millions for salaries and wages, $368 millions for materials for processing and $18 millions in fuel and electricity. Compared with 1942, the increase in capital was 61.1%; in salaries and wages 9.2%; in cost of materials 53.7%, and in value of production 52.5%. About 44% of the production in 1943 was from Ontario with 484 establishments and output valued at $338 millions. Quebec, with 310 factories and production worth $372 millions, accounted for 49%, and British Columbia with 61 plants and output at $28 millions accounted for 4% of the total. Imports of chemicals and allied products amounted to $70.5 millions in 1943 compared with $66.8 millions in 1942. Exports increased to $86.4 millions from $77.3 millions in 1942.

—Agricultural and Industrial Progress in Canada

★ IN 1920 there were 297 industrial research laboratories in the United States, staffed by approximately 7,400 technically trained men. This number rose to 1,000 laboratories and 19,000 men in 1927; 1,520 laboratories and 33,000 men in 1931; and 2,350 laboratories with 70,000 chemists, chemical engineers, physicists, biochemists, bacteriologists, etc., in 1940.

—R. C. Swain, Research Director, American Cyanamid Co.

(*Continued from Page Eighteen*)

ics, said that to the scientist 'only that which is measurable is real.' This may at first seem too restrictive a generalization; but you will search a long time in the physical world before you will find something that is not measurable in one way or another. The astronomers tell us that there is helium gas in the sun. They have never been able to weigh it or get a sample of it or even see it. Its existence is known only from the fact that the spectrograph of the sun shows a clear band corresponding to the same band in the spectrum of other irridescent gases which are known to contain helium. This is a measurable 'effect,' and brings the matter of helium in the sun within the field of the scientist.

In contrast, the philosophical idea that animals have souls, though it might interest you as a question for speculation, and might be welcomed by a college debating society as a subject for their weekly tug-of-war, is nevertheless outside the scientist's sphere of investigation because no metrical notation of any kind can be made of manifestations of such an entity. The scientist does not deny the existence of souls in animals; he just leaves the whole question to others and goes on with his work.

Since the findings of science are the results of verifiable measurements made in the real world, it follows that science is not authoritarian. In the middle ages any question as to the real world was referred to the classical philosophers, chiefly Aristotle. Their pronouncements were final and if their writings said nothing about it it could be classed as unknowable, and forgotten. If a statement **had been** made (such as that the Earth is the centre of the universe) then anyone who questioned the overwhelming wisdom of the ancients was a fool or worse. But in modern times all scientific statements are open to refutation by anyone at any time. One of the most tenacious concepts of the eighteenth and early nineteenth centuries, the caloric theory of heat, was invalidated by the work of three relatively obscure men—Mayer, Joule and Helmholtz—who were none of them professional physicists.

The acceleration of gravity at the surface of the earth is stated in the physics textbooks as 32 feet per second per second. This was not established by edict or by

legal authority, like the price of sugar, or by tradition, like the color of Judges' gowns, but is simply observed in nature. The use of copper or aluminum wire in electrical transmission is not the result of one group or another winning a debate in a legislature; it is just a matter of the tensile strength, conductivity, durability, etc., of various available substances, an example of a decision dictated by the physical factors and not by political or legal manipulation.

Technocracy points out that in North America in this day and age the end of an era is right ahead of us, an era of scarcity and hand toil, in which business direction of production and distribution has been able, by such devices as government pump-priming, huge foreign loans, unemployment relief and wars and rumors of war, to stave off the problems arising out of modern technology. In that past era distribution has never been a designed operation; it has always been a haphazard scramble, with big business wielding the heaviest club, aided and abetted—in exchange for varying degrees of social security—by a motley following of politicians, pressure group spokesmen, press men, the 'legal fraternity,' economic medicine men, and a host of chiselers, big and small, operating within or outside of the law.

But now, with the war over, the business man's paradise of almost universal scarcity begins to fade before a looming nightmare of over-loaded warehouses and mass unemployment. It becomes increasingly apparent that, as Technocracy has steadfastly pointed out, the problems of distribution created by applied science will be solved only by a unified application of science to the social order.

Scarcity is not a mere accident of business operation; scarcity is the very air that business breathes. You can't sell to a glutted market, and every business man knows it. That means that distributing abundance is not a job for business. It is a job of social engineering.

In the years immediately ahead of us the realization of that statement will be forced on the people of this Continent by the demonstrated inability of business to distribute to the general citizenry the goods and services which they themselves produce.

The alternative then will be scientific distribution, in which the process of getting the products of North American factories into use by the people will be integrated with the actual production schedules in a unified over-all design. The general specifications for that job have already been drawn up.

This generation of North Americans will be forced to break from the past era of scarcity and business; they must unite in a vast engineering project and live in the new era of abundance made possible by applied science.

—W. A. Adam

★ MODERN CEMENT-MAKING is an industry, really an art, which was lost for ages but rediscovered in the middle of the 18th century by the famous Scottish engineer Smeaton who built the first Eddystone Lighthouse that withstood the stress of wind and sea. The Egyptians, the Carthaginians and the Romans all knew about cement and used it. The Pyramids are a proof of this fact. When the glory of Rome faded, cement-making seems to have vanished utterly and later builders were nonplussed to duplicate the enduring structures of the ancient architects until Smeaton, looking for some substitute for lime mortar which would set hard under water, hit upon it by burning impure limestone mixed with clay. Portland cement first appeared in 1824. An English stone mason, Joseph Aspdin, made it. His cement was called Portland because it bore a fancied resemblance to building stone quaried on the Isle of Portland. The production of Portland cement in Canada in 1943 amounted to 7,302,000 barrels, as compared with 4,509,000 in 1936 and 12,284,000 in 1929.

—Dominion Bureau of Statistics

★ IN 1886 ALEXANDER BUNTIN installed at Valleyfield, Quebec, what is claimed to have been the first wood grinder in America and began the manufacture of wood pulp by the mechanical process. About the same time, one Jacob Thomson was successful in his experiments to manufacture paper from wood by using caustic soda to dissolve the non-cellulose components, and his employers built the first chemical wood pulp mill in Canada at Windsor Mills, where production began in 1869. At the beginning of the present century the output of the pulp and paper industry in Canada was valued at about $8,000,000, increasing to $137,913,000 in 1919. In 1943 the value reached a new high peak of $345,653,000.

—Dominion Bureau of Statistics

★ WHEN IT WAS EVIDENT that shipping difficulties might impede the imports of chromite into Canada, steps were taken to encourage production from the known deposits in Quebec. Chromite is used in the manufacture of refractory brick, as ferro-crome in the manufacture of certain ferrous alloys, and in the metallic form in certain non-ferrous alloys. Production in Canada rose from 355 tons in 1940 to 27,720 tons in 1944.

—Dominion Bureau of Statistics

Five Years Too Soon?

In the summer of 1940, *Technocracy began urging North Americans to adopt Total Conscription as the most efficient method of defeating fascism abroad and at home. ..Today, Technocracy reiterates its demand for the technological consolidation of this Continental Area to win the battle of the peace.*

IN the early summer of 1940 the armed might of the Third Reich descended upon the low countries and France in the face of a merely token resistance and thereby completed the piecemeal consolidation of a fascist Continent into of Festung Europa. The strategy of internal corrosion by fascist intrigue had succeeded to the letter, even while North America, boisterously excited about it, knew not yet what it was. Technocracy Inc., knowing fascism by its right name, demanded immediately that the Governments of Canada and the United States carry out a program of Total Conscription of Men, Machines, Materiel, and Money for the defeat of fascism abroad and at home! Technocracy presented to North America the minimum specifications for defense of Continental North America against a world-wide fascist conspiracy which stood ready to attack North America from all sides simultaneously when the time was ripe. The demand has been widely supported, but it was ignored. Technocracy repeated its earlier demand that North America cease and desist from the export of the sinews of war to the world's fascist states regardless of their nominal neutrality. The export continued.

Between North America and fortress Europe Britain stood alone.

In making this brief analysis of the course of the war Technocracy wishes it clearly understood that for the personnel of the allied armies, navies, air forces and merchant marine it has nothing but the highest respect. Within the limits of the grand strategies employed and equipment provided they have done a job that shall live in history. Technocracy honors with its salute those loyal men, Technocrats included, who fell in the struggle against fascist aggression. Technocracy acknowledges the tremendous and vital job done by those who manned the plants at home.

The lifeline of aid to Britain held not because America established command of the sea routes, but because this Continent's incredible technology succeeded throughout 1942 and into 1943 in building ships faster than the undersea fleets of the Third Reich could sink them.

Britain retained control of the air partly by good old British bluff, partly by the dauntless, reckless courage of the Spitfire pilots, but largely as a result of the integrity and persistence of two scientific men of vision in the face of National apathy and appeasement. One was the designer of the Spitfire Mk I, the other the inventor of the British CH radar equipment. Thousands came after, but these are the men whose contribution was decisive.

The enemy who had bungled the Schlieffen Plan in 1914 obligingly permitted a historic repetition in failing to consolidate its gains: North Africa, the gateway to Europe's soft underbelly, and Europe's southern outer wall, was fatuously frittered away; England, the Okinawa of Europe's heart, was not overwhelmed, partly as a result of hard fighting and sheer bluff, and partly in the interests of historic boner number three, the calamitous attack upon Russia.

The Japanese, evidently forgetting that a sunken fleet can be replaced, since such a feat is hardly possible in Asia, failed to consolidate its Pacific gains especially at Pearl Harbor.

Now it can be stated that at the time to defeat Germany was within a few months of the successful creation of an atomic bomb, possibly also an atomic engine of propulsion. She was likewise within a few weeks of successful completion of fighter aircraft of a new and unique design and, by all accounts, an unsurpassed performance. Scattered accounts of progress made in the direction of other and even more fantastic weapons cannot be offhandedly discredited, as they do not come from screwball sources.

The German blunders which saved the non-fascist world from inconceivable destruction at the hands of the fascist world seem to be these: the muddlement of superman philosophy into a half-baked science of geopolitics to the neglect of the essential physical facts of Europe's geographical conformation; the incoordination of the German general staff and the German state in the pur-

suit of a dream of 'destiny', and, last and most important, the interference with mobilization of scientific research which seems to have occurred as a further error on the part of the political state.

Can anyone say for sure by what narrow margin the allies escaped disaster? Four Scandinavians endured for several months the hell of Arctic winter night and succeeded in crippling a heavy water plant. The British Prime Minister announced that a bomber crew had succeeded in scotching another. The fate of the non-fascist world may conceivably have hung upon the lives of just such a handful of heroic men .

Certainly Technocracy can concur in saying that 'never was so much owed by so many to so few.' But let Technocracy add that 'never was so little owed by so many to their own unity of national valor and foresight.' For apart from those millions in the services above mentioned, our national unity was a united scramble for the wages, profits and differential advantages of war; our national foresight was the petty acumen of politics and business.

It may be argued that Technocracy's specifications for Continental defense were given to the world before their time. Yet North America was spared the need for installing them by nothing more tangible than damfool luck. Technocracy is not discredited by having been in there five years too soon.

In September 1939 Technocracy Inc. laid down a new and revolutionary concept of a Pax Americana. The San Francisco conference achieved a weird effigy of 'Pan Americana' by a set of diplomatic manoeuvres which, if carried forward into a world federation as a system of bloc coercion, may well plunge America into a war with the Soviet Union, as Technocracy has bluntly indicated before. The success of the atomic bomb is now a sober fact, and 'he who creates a new idea does so in the certain knowledge that it will be stolen.' It is a further sober fact that radio control can now be accurate for distances up to 1400 miles to an error of less than 0.5 percent. This margin may even now hold good for greater distances. And what of the future? This Continent now appears to possess the lion's share of the world's uran-

ium, but if America should for any reason permit herself to become involved in war with the Soviet Union, or with a possible future pan-Asiatic bloc, or with any possible combination of nations, the bulk of our uranium reserves lie within an area which may easily become a battlefield. Technocracy's delineated area for the defense of America is of greater ultimate importance now than ever before.

South Africa's Jan Christian Smuts has taken it upon himself to warn America's youth to be ready for another conflict. Pistol Packin' Patton has jovially gone on record with the same happy suggestion. Technocracy has no intention of standing idly by and permitting this country or this Continent to be manoeuvred by the senile fears of the Russophobes. Yet Technocracy does more than support the exponents of national military training for youth: Technocracy has advocated and continues to advocate the establishment of a permanent defense force of one million officers, fully competent engineer-mechanics kept up-to-date in the mastery of technological warfare, to act as instructors for all of America's able-bodied youth. Why piddle around with debatable half-measures?

Technocracy has demanded that the people of North America establish a full economic and military alliance with the U.S.S.R. Technocracy has demanded that America, in achieving its Continental technological destiny, establish Pax Americana for all time. Technocracy has shown that only contiguous, self-contained, and self-sustained Continental organisms of the order of North America, as this world's number one technological area, and of the Soviet Union as the world's number two technological area, can coexist in a state of permanent peace in the world of today and tomorrow. Therefore, let America lose no further time in consolidating the defense and technological operation of this Continent that it may remain America—now and forever. **—Ted Fearman**

★ UNFORTUNATELY, we are much further from victory over fascism than from victory over the German armies. Fascism fights us in both continents in the New World. Fascism will fight on from new basis after military victory is complete.
—Henry A. Wallace

Civilization Is Facing Disaster

If our political and economic thinking were conducted on the same level of efficiency and modernity as our scientific work and engineering activities we could be enjoying a material utopia with little expenditure of physical effort. —Dr. Harry Elmer Barnes

NEVER before in the history of mankind has there been such a gulf between technology and social institutions. We have a thoroughly up-to-date material culture, complete, varied and potentially efficient beyond comparison with that of any earlier age.

On the other hand, our institutions and social thinking, through which we seek to control and exploit our advanced material culture, is an antiquated mosaic compounded of accretions added from the stone age to the close of the eighteenth century.

When a man desires to have a bathroom faucet repaired, a new tube put into his radio or a tooth pulled he thinks he must call in an expert.

Yet when he faces the much more complicated problems of public life he rests completely satisfied with the opinions of the man in the street. He wants a brain trust to design his automobile, but won't have anything to do with one when it comes to planning his government.

This is no idle gossip or amusing reading. It lies at the heart of our social crisis today. No matter what aspects of our social problems we consider, it is always a secondary manifestation of the major evil of our day— the gulf between machines and institutions.

If our political and economic thinking were conducted on the same level of efficiency and modernity as our scientific work and engineering activities we could be living in an era of international security and could be enjoying a material utopia with little expenditure of physical effort. We produce goods with the very latest machinery, but we utilize them by means of ideas and institutions which date back a century or a millennium.

However light-heartedly we may view this striking discrepancy in our civilization between our machines and our institutions,

a frightful penalty has already been exacted for our dilatory stupidity, and if this condition continues it may demand the supreme penalty of the extinction of civilization.

This fatal maladjustment in contemporary life has produced economic depressions and countless financial disasters. It has brought democracy close to extinction. It has made our legal system inadequate and produced widespread contempt for law in general. It has given us a crime bill running into the billions each year, and enabled the greater criminals to render themselves safe from molestation, to say nothing of conviction. It has bred moral chaos and educational futility.

The upshot of all this is the spectacle that we behold today—the impending collapse of western civilization from internal weaknesses.

If society wakes up in time and closes the gulf by bringing our institutions up to date, we may literally 'inherit the earth.' If we go on as we have so far in the twentieth century there is not even a gambling chance of preserving civilization for more than another generation.

—Dr. Harry Elmer Barnes

★ NEW YORK, Aug. 27. — The atomic ovens that make the new plutonium metal for bombs in Washington State are producing nearly as much energy as will the Grand Coulee Dam in the same state at its peak.

Grand Coulee will have a hydro electric capacity of 2,000,000 kilowatts. The atomic oven power is in the form of heat which, although a fraction of it is enough to warm the great Columbia River in a day, is not at present useful. The ovens were designed to get rid of heat, instead of collecting it for power.

Redesigning the ovens to produce steam is an engineering job that may take years. The atomic heat at present is spread like a prairie fire, over a large area. There is no engineering method of using the heat of a prairie fire.

However, in the present ovens the atomic fires are not as hot as those in a blazing prairie. About 300 degrees Fahrenheit is the top temperature permitted in the uranium slugs that are baked to make plutonium.

This temperature is not the highest possible. But experiments have not been reported as to how hot an atomic fire can be run with safety. Atomic fires also can be set up in a more concentrated form. This too, is an engineering problem not yet perfected. —Associated Press

A Ten Year Battery

Unless North Americans eliminate Price System methods of operation they will have won the war only to lose the peace. Total Conscription by the Government of all patents, inventions, and processes is the answer to fascist cartelization in the immediate postwar period.

FOR years Technocracy has been pointing out that the Price System sabotages technology. The anti-trust suit which was filed in the U. S. Federal Court against the Electric Storage Battery Company of Philadelphia, and its wholly owed subsidiary, the Willard Storage Battery Company of Cleveland, is merely another sample of a Price System at work.

The complaint, signed by Attorney General Francis Biddle, alleged that the above named companies—two of the largest manufacturers of storage batteries in the world—had withheld a long-life storage battery from the market in the United States, with the alleged result that operation of military equipment had been greatly affected. Mr. Biddle charged that the product known as the nickel-cadmium battery had a reported ten-year life span as against three years for average batteries. 'Cadmium batteries have not been made, used, or sold in this country and have not been used by the armed forces of the United States,' the suit stated. 'As a result of the conspiracy herein alleged, the United States has had neither the commercial experience nor the manufacturing facilities necessary to determine the advantage of cadmium batteries over other batteries for commercial and military uses.'

The companies were charged with maintaining international cartel agreements to divide the world markets and to eliminate competition in the manufacturing and sale of electric storage batteries in violation of the Sherman Anti-Trust Act.

Mr. Biddle also alleged that the defendants conspired with a Canadian, English, and German company in a series of agreements and acts going as far back as 1891 to eliminate competition among themselves in world markets 'by allocating to each exclusive sales territories and by fixing prices in non-exclusive territories.'

The complaint named as co-conspirators but not as defendants in the suit, the Chloride Electrical Storage Company, Ltd., London, said to be the world's leading manufacturer of electric storage batteries, which has 49.77% of its voting stock held by the Electric Storage Company; Accumulator-en-Fabrik Aktiengesellschaft, Berlin, the largest manufacturer of electric storage batteries in Germany when it was in operation, and the Exide Batteries of Canada, Ltd., Toronto, wholly owned subsidiary of the Electric Storage Battery Company and a leading manufacturer of batteries in Canada.

Mr. Biddle claimed that the conspiracy resulted in restriction of exports of storage batteries by Electric Storage Battery Company and its subsidiary in world markets; restriction of production and distribution in the United States. He pointed out that the Electric Storage Battery Company has become the dominant storage battery producer in that country.

The complaint charged that the major agreements and understandings in this continuing conspiracy were based on patents that 'have all expired.'

With World War II coming to a close, North Americans must mobilize for the peace. Unless they eliminate Price System methods of operation they will have won the war only to lose the peace. Total Conscription by the Government of all patents, inventions, and processes is the answer to fascist cartelization in the immediate postwar period.

—Robert Lyall

★ WHILE THE EFFICIENCY ENGINEERS save a few drops at the spigot, a torrent is rushing out of the bung-hole. What is the use of making two blades grow where one grew before when the whole may be burned or abandoned? An economy that relies for its stimulation on waste and disaster is taking the road to oblivion as surely as the dinosaurs, those creatures that were all bulk and no brains . . . I have in my files pictures of veritable mountains of oranges, potatoes, coffee marked for destruction. Nearly every farm crop has been plagued by surpluses since the last war . . . In the case of factories the problem of surplus is present in the form of excess capacity, but the mountains of unsold manufactured goods cannot often be photographed. A factory can close down faster than a growing crop. —STUART CHASE in *Where's the Money Coming From*

'So You Can't Have Health?'

Author Dyson Carter shows how medical discoveries are interfered with or suppressed in order to maintain an abundance of disease, a scarcity of curative methods, and a high price for individuals and groups who make a living out of peoples' sicknesses.

IN the opening paragraph of **So You Can't Have Health?** Dyson Carter says: 'This book reveals facts about your health which have been totally suppressed. Although you rightly feel that your state of well-being or sickness is a strictly private matter, your own personal concern, nevertheless very powerful individuals and groups make it their business to interfere with your health.'

Author Carter then proceeds to document his thesis with concrete examples which indicate that Price System methods keep us from enjoying a much higher standard of health than we know today.

In his first chapters Carter tells the story of Dr. Harry Steenbock, 'The Wisconsin Alumni Research Foundation,' and Vitamin D. Carter's account—which is backed up by U.S. Department of Justice documents and court records (notably those covering the Rene Douglas case, and in 'Vitamin Technologists vs. the Foundation,' U.S. Circuit Court of Appeals for the Ninth Circuit, No. 10079, Nov. 24, 1944)—states that Steenbock and his associates scored the following Price System successes:

1. They had an American monopoly of Vitamin D production and sale, preventing all but their own group from using Steenbock's discovery, dictating prices, and rigidly limiting the amount of the Sunshine Vitamin which could be sold.

2. They gathered together a group of powerful pharmaceutical (drug) manufacturers who agreed to co-operate to prevent any new Vitamin D processes from being used.

3. They were able to force the public, the drug trade, and the medical profession to pay unbelievable prices for this health-giving substance: one million units of Vitamin D costing 15 cents to make was sold to drug wholesalers at $3 to $7, to the public and doctors for $5 to $11. (Re-

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So You Can't Have Health? *is published by the Progress Publishing Company. Price:* 25 *cents.*

tail prices in Canada range from $1.25 for a prescription specialty up to $19.45 per million units, the price of a standard Vitamin D preparation for babies being $7.00 per million units—**for fifteen cents worth!)**

4. They were able to prevent the use of Vitamin D in everyday foods; when they did allow it to be used in such foods, for advertising purposes, the manufacturer was not permitted to put in enough Vitamin D to cure rickets.

5. They carried on a clever publicity campaign which gave the impression that the Foundation was doing everything possible to promote Steenbock's discovery and rid the world of rickets-crippled children and mothers.

6. They effectively prevented any lowering of Vitamin D prices by using a 'black list' of drug companies that wanted to sell the vitamin at a reasonable price.

7. They suppressed scientific research which would have shown how Vitamin D could be made by other and even cheaper processes than Steenbock's; they bought up cheaper processes and suppressed them. Years ago the Milas Process for making Vitamin D at low cost was purchased by Dupont, one of the Foundation's licensees; this was done 'to prevent anyone from using it to manufacture Vitamin D in competition with the Steenbock patents.' To this day the Milas Process has not been used by Dupont. It is a suppressed discovery.

8. They extended this North American cartel to a gigantic world cartel to exploit Vitamin D, dividing the earth up among themselves, the notorious I. G. Farben cartel of Germany, and other trusts.

9. Because ultra-violet light was required in the Steenbock processes, the Foundation further tightened its monopoly by signing up two of the biggest U-V lamp manufacturers; the latter agreed to sell their lamps only to companies approved by the Foundation.

To show how monopoly controls the use of other vitamins, Carter compares their cost and selling price: One gram of Vitamin C can now be produced for 3 cents; it sells in the drug store for as high as 60 cents. One gram of Vitamin B1 costs 20 cents to make; it is sold for as much as $6.

In a chapter on 'Baby Bargains —$25 Each' Author Carter recalls the nutritive experiment with

several hundred Toronto mothers in which it was proven that the majority of Canadian babies (about 51%) who die in childbirth or soon after might be saved by $25 worth of food, which contained Vitamins B, C, D, and the animo acids.

Throughout, Carter shows how medical discoveries are interfered with or suppressed in order to maintain an abundance of disease, a scarcity of curative methods, and a high price for individuals or groups who make a living out of peoples' sicknesses.

This is a book that should be read by every North American. Technocrats, with their previous background of information on the monetary motives of Price System operation, will find it particularly significant. They will welcome the documentation on cartel interference with public health. At the same time, they will see that it is the Price System game itself—and not individual human perverseness—that leads to such socially detrimental behavior. They will, therefore, be more objective and less emotional than Carter in utilizing the facts that he has accumulated.

—Donald Bruce

★ IN 1884 the steam boat, the steam engine, the cotton gin, the electro-magnet, telegraph, sewing machine, and bicycle had been invented. Chloroform and ether were known and yet the then U. S. Commissioner of Patents made this statement: 'We see the arrival of the period where human improvement is at an end.' During the next few years, the Bessemer steel process was invented, aniline dyes and cocaine were isolated, and somewhat to my regret, the lawn mower and the typewriter were invented. This so impressed the then U. S. Secretary of the Interior that he announced in 1875: 'New materials and new inventions have now transformed our society into its final phase, so scientific inventions can take us only a little way further.'

These people and their more modern counterparts are probably all direct mental descendents of a legendary bird known as the little auk, who always flew backwards to keep the wind out of its eyes, and also because it was more interested in seeing where it came from than where it was going.

—R. C. Swain, Research Director, American Cyanamid Co.

★ THE FIRST WORLD WAR required a total of only 62,000 tons of rubber. In this war we have already consumed fourteen times that value for direct military use. We have supplied 167 pounds of rubber products, practically his weight in rubber, for every man in the armed services. Every bomber uses almost half a ton of rubber in bullet sealing fuel cells and the B-29's or Superforts use four times that much. —Dr. A. W. Bull, United States Rubber Co.

Notes on Organization

TECHNOCRACY is an organization which has undertaken the task of preparing the people of North America for a major social change; a social change which the pressure of events, induced by the unique conditions prevailing on this Continent, will render inevitable; a change which will entail the abandonment of many of our cherished opinions and traditions; a change which will wipe out many of the values of yesterday and today; a change utterly beyond the vision of even the most radical political party.

We are living today in two worlds: First, there is the world of philosophic imponderables; the world in which we hope and vote for things to happen; the world in which the sanction of tradition and opinion governs our behavior. Then there is the actual physical world; the world we can perceive with our senses; the world in which events take place in accordance with physical laws. This latter world can be described by exact measurements and in clear terms.

A great deal of nonsense has been disseminated by the 'moulders of public opinion' regarding the Organization of Technocracy and its objective. Technocracy has been charged with 'soullessness and the deliberate cultivation of the materialistic concept of life.' Its objective has been described as the 'institution on this Continent of a scientific dictatorship, which will impose upon us a monotonous and mechanical regimentation.'

The physical world and our existence in it is the immediate concern of Technocracy, but this does not mean that Technocracy is dedicated to the materialistic aspect of life. Technocrats know that dreams and aspirations regarding the cultural aspect of life cannot be realized until we have established a firm foundation of social security for all the citizens of this Continent. We must build upon the concrete particulars of physical science and not upon the frothy generalities of political philosophy. The social aspirations of the Technocrats are based on factual knowledge and a comprehension of the most probable; they are not induced by wishful

thinking and ponderous platitudes.

Technocracy has no interest in perpetuating the business concept of existence. It does not compromise with any political party, radical or conservative. It is not attracted by the ideal of a well-organized poorhouse in this land of potential abundance. It does not subscribe to the doctrine of salvation through toil or believe that real prosperity will bring degeneration of our moral fibre. It is not to be diverted from its objective by the milk and water panaceas of the radicals or by the nebulous emanations of the intellectual liberals—those unfortunate people whose mental processes flap around in every emotional breeze, like Monday morning's washing on the line.

It requires a certain amount of mental discipline to analyze and, if necessary, to discard some cherished conception that is deeply rooted in the structure of the mind. We like to believe what we have always believed, and whenever doubt is cast upon our beloved assumptions, we immediately look for arguments to justify them. Most of our so-called thinking consists of finding excuses for continuing to believe what we have been conditioned to believe.

We are creatures of habit and we want to cling to our established lines of thought, action, and behavior as long as possible, and it is rather astonishing how much hardship and discomfort we are willing to endure in order to cling to them. However, the people of North America will shortly be confronted by the greatest problem of readjustment that has ever faced mankind: The stress of circumstance, induced by the application of physical science to the means whereby we live, will force us to adopt other lines of thought, action, and behavior, which with competent leadership will start us on the way to the highest type of civilization this planet has ever known.

Technocracy does not expect that all the citizens of this Continent can discard their mental shackles in time to be of much use in the critical days that lie ahead. However, if the intelligent minority can clean their minds of the accumulated trash of centuries, they can provide the leadership along the road which will culminate in a new way of life and a culture beyond our present imagination.

—J. H. Soans

TECHNOCRACY

WHAT?

Technocracy is science in the social field. **Encyclopedia Americana** says: 'Whatever the future of Technocracy, one must fairly say that it is the only program of social and economic reconstruction which is in complete intellectual and technical accord with the age in which we live.'

WHEN?

Technocracy originated in the winter of 1918-1919 when Howard Scott formed a group of scientists, engineers, and economists that became known in 1920 as the Technical Alliance—a research organization. Some of the better known names in the Technical Alliance are of interest. such as: Frederick L. Ackerman, architect; L. K. Comstock, electrical engineer; Stuart Chase, C.P.A. (now well-known writer); Bassett Jones, electrical engineer; Leland Olds, statistician (now Federal Power Commissioner); Benton Mackaye (now in the Forestry Department); Charles P. Steinmetz and Thorstein Veblen (both now dead). Howard Scott was Chief Engineer. In 1930 the group was first known as Technocracy. In 1933 it was incorporated under the laws of the state of New York as a non-profit, non-political, non-sectarian membership organization. In 1934 Howard Scott, Director-in-Chief, made his first Continental lecture tour which laid the foundations of the present Continental membership organization. Since 1934 Technocracy has grown steadily without ~~any~~ spectacular spurts. revivals. collapses, or rebirths. This is in spite of the fact that the press has generally 'held the lid' on Technocracy, until early in 1942 when it made the tremendous 'discovery' that Technocracy had been reborn suddenly, full-fledged with all its members. headquarters, etc., in full swing!

WHY?

Technocracy's survey of the economic situation in North America leads to the conclusion that there is in development a process of progressive social instability, that this process will continue until the instability reaches the limits of social tolerance and that there then will have to be installed on this Continent a social mechanism competent to meet the needs of its people. Technocracy finds further that the day when social operations on this Continent can be based on a method of valuation has passed, and that it is now necessary that there be applied in the social field the quantitative methods of physical science. Technocracy, therefore, proposes that the North American Continent be operated as a self-contained functional unit under technological control. This control would operate the area under a balanced-load system of production and distribution, whereunder there would be distributed purchasing power commensurate with the resources and the continuous full-load operation of the physical equipment, with the guarantee of a high standard of living, equality of income, and economic security, at a minimum of working hours. to every adult inhabitant.

HOW?

At this stage the objectives of Technocracy are first, the education of the people of North America to a realization of the conditions behind the social crisis, and second, the organization of all those willing to investigate and interest themselves into an informed, disciplined, and functionally capable body whose knowledge and ability can be called upon to prevent chaos in North America at that time, now imminent, when the Price System can no longer be made to operate.

Let's Declare War on Peace!

NORTH AMERICA'S WAR is here and now, in this country and on this Continent—a patriotic war against the peace of this Price System, against its poverty and its malnutrition, its crime, its sudden death, and its disease. It is a war of plenty versus poverty, of technology versus toil, the war of tomorrow against yesterday, of science versus chaos.

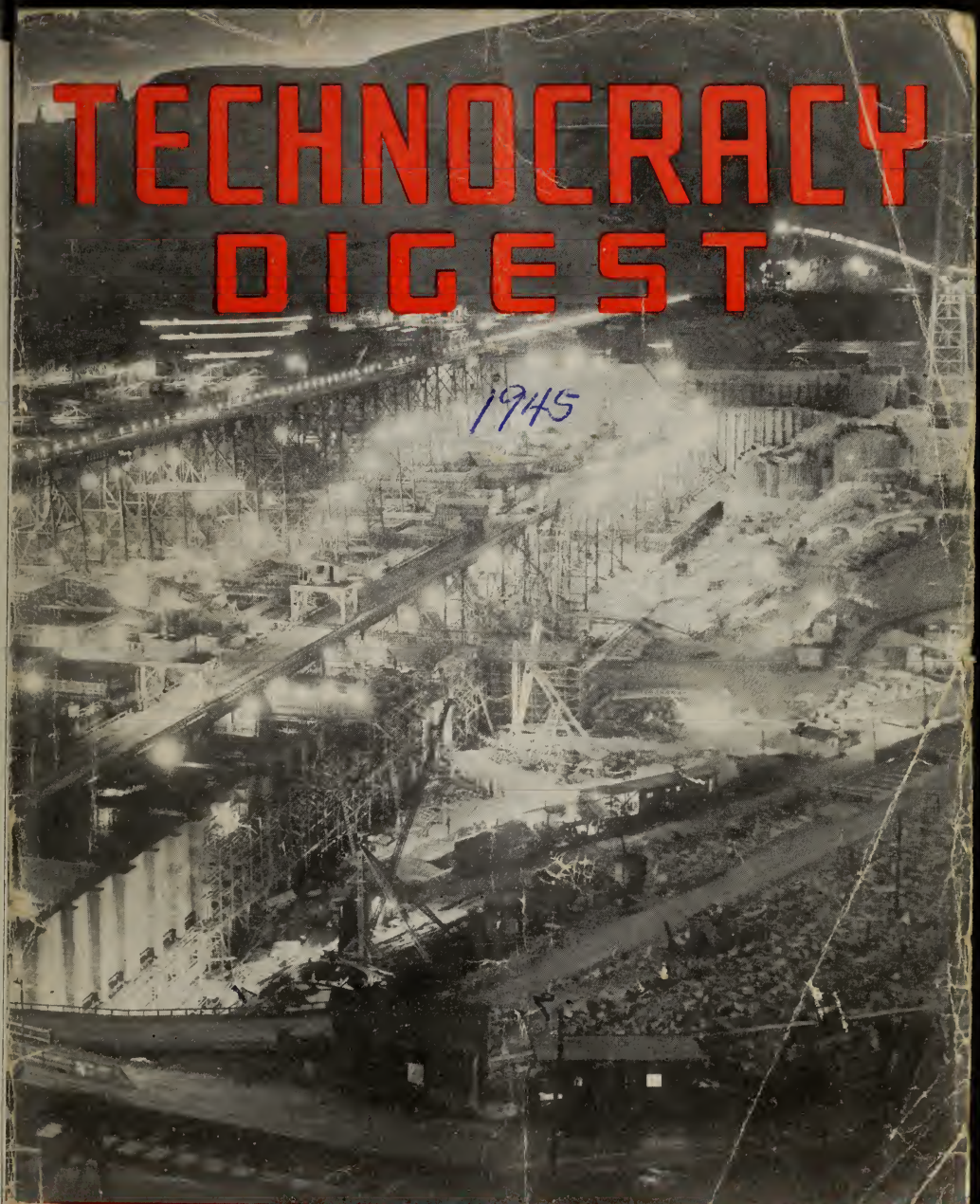
War ends in victory or defeat, but the peace of this Price System has no end, merely disintegration. So let's offer the youth of this Continent a new war, a fight worthwhile, a battle royal, a war to fulfill this Continent's rendezvous with destiny. Let's declare war on peace, the peace of this Price System.

—HOWARD SCOTT

(SECTION STAMP)

TECHNOCRACY DIGEST

1945



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TECHNOCRACY DIGEST

THE ONLY MAGAZINE IN CANADA THAT IS PREPARING THE PEOPLE OF THIS COUNTRY FOR SOCIAL CHANGE

VANCOUVER, B. C. 84 A SPECIAL SUPPLEMENT

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FRONT COVER

The Grand Coulee Dam on the Columbia River is the greatest structure on the face of the earth. Technocracy, which proposes that things be done with a minimum of human labor so as to produce a maximum of physical wealth, would apply the technology which was used in the construction of Grand Coulee Dam, not only to the entire hydrology of North America, but to all of the pertaining end-products —the utilization of rivers; the transmission and distribution of power; and the use of the lands affected by the control of the water. To Technocracy, the job would not begin and end with the construction of the dam and power house. *That* would be only one link in a chain of functions for the attainment of a maximum of efficiency on this Continent. —(BUREAU OF RECLAMATION PHOTO)

Why Do You Vote?

THIS month the citizens of Canada will cast their ballots in a Dominion election. Here are some questions that the people of this country should ask themselves as they go to the polls:

Are any fundamental issues being voted on—the kind that will drastically affect the social welfare of the individual citizen?

Which—if any—of the parties has a concrete program that will ensure economic security for **all** in the postwar period?

Does the act of casting a ballot provide much real freedom to the individual citizen today?

Can we have freedom without economic security?

Which—if any—of the parties has ever fulfilled its election promises?

Is a political platform merely something to stand on in order to get in?

What are the actual functions of political government? Does it do anything other than spend the taxpayer's money and act as a referee between capital and labor?

What does your vote do for you?

Is 'counting noses' an efficient and scientific way of arriving at social decisions in the Power Age?

Will the winning party be elected by a majority of those eligible to vote? Has it ever been?

Has the candidate you are voting for any knowledge of the problems involved in operating a highly mechanized, tenuous, and complex society?

Would that candidate be likely to remove himself from political office if he thought it in the interest of the nation for him to do so?

Can any political party institute a planned economy of abundance on the North American Continent under the Price System?

Can we install a new social mechanism merely by marking X's on pieces of paper or do we need a trained disciplined organization—a Technological Army—to do the job?

The march of events within the next five years will force an answer to these questions.

—The Editor

The Vultures of the Peace

This war is a world conflict between two opposing policies — Rome and Moscow. How can you expect anything but an international double cross to come of San Francisco when the majority of nations invited are allies of the policy of Rome?

THE technological weapons of total war have spread ruin and devastation halfway around the civilized world. In World War I the devastation of military conquest was mostly confined to the no man's land between the opposing armies. In World War II the airplane, the flying bombs and the rockets have carried death and desolation, destruction and demolition a thousand miles beyond the fighting front.

The industrial heart of Europe is comprised of that territory which includes eastern France, Luxembourg, part of Belgium, Holland, the Saar, the Ruhr, the Rhineland, Italy north of the Po, eastern Austria and Czechoslovakia, to its eastern frontiers in Polish and German Silesia. From out of this industrial heart of Europe flowed a production of physical wealth that was not only the lifeblood of Europe but reached the far corners of the earth. Never in the history of man has the devastation and destruction of the means whereby human beings live been carried so far and wide, never have so many habitations, public buildings and industrial plants been reduced to so much rubble.

The civilization of the world has been torn apart in the bloodiest, most devastating struggle of all time. This struggle had its immediate beginnings in the first Fascist political party propaganda by Mussolini and Hitler almost simultaneously in Italy and Bavaria in 1919. The opposing combination of forces first began to coalesce in the Anglo-French partition agreement of December 1917 which culminated in the erection of the Cordon Sanitaire. Historically, this conflict had its beginning 730 years ago when Pope Innocent III, a spiritual pontiff, became an international political sovereign and declared the Magna Charta null and void, deposed King John of England, and appointed Prince Louis of France to the English throne, to

be followed by the formal establishment of the Inquisition in 1230. This was the historical beginning of the coalition of forces in western civilization that were to finally flower in the Fascist domination of Europe in 1942, and these are the forces that will finally culminate in a defeat of annihilation in 1945. European Fascism has staged the last counter-revolution in over 700 years of European history. The Bourbons and the clericals, the nobles and the peasants have made their last great military effort to reestablish the Fascism of the Holy Roman Empire. For over 700 years the kings and nobles and later business and finance, always with the church at their back, have stood as the great preservers of the status quo. They have stood as the bulwark in European society against social change to maintain **their** law and **their** order, and to permit only that change which enhanced their economic, political and ecclesiastical power.

The Treaty of Westphalia in 1648 terminated the bloody religious battles of the Thirty Years War. The Treaty of Westphalia was in actuality only an armistice between Rome and the forces of reformation that represented social change at that time. Hitler as the leader of German Fascism continually screamed for the abrogation of the Treaty of Versailles and the Treaty of Westphalia, thereby fervently proclaiming the historical connection that we have delineated here. The Bolshevik Revolution of 1917 introduced social change of a new order.

The forces of reaction and counter-revolution immediately got under way on the international scene to suppress and overthrow this revolutionary upstart among the nations, this new harbinger of social change. Russia was invaded without a declaration of war by the armies of Britain, United States, France, Italy and Japan, her former allies in World War I, and by German armies, her former enemies in World War I. Russia was isolated in Europe by the erection of a Cordon Sanitaire around her western boundaries. The Cordon Sanitaire were the puppet states of Finland, Esthonia, Latvia, Lithuania, Poland and the territorial subtractions accruing to Romania and Turkey. It must be borne in mind that the Cordon Sanitaire was thought up by the

Bourbons and nobility of big business and finance of western Europe with the spiritual benedictions and support of the Vatican. Fascism first emerged as a political action in the Catholic countries of Italy, Rhineland and Bavaria. It is interesting to note that the Roman Catholic hierarchy under the command of the Vatican began preaching a holy crusade against Bolshevism. Fascism in Europe became the political action first, and later the military action of this holy crusade.

Fascism achieved political control in Italy in October 1922. In 1923 Hitler's National Socialist Party, the Fascist party of Germany, went down to temporary defeat in the Beer Hall Putsch of Munich of that year. Fascism did not gain control in Germany until early 1933 when Von Papen maneuvered a senile and dying Hindenburg into appointing Adolph Hitler Chancellor of the Reich. From then on the development of Fascism accelerated. In 1935, Poland adopted a constitution that would permit the creation of a Fascist state. This was shortly followed by civil war in Spain under the leadership of Francisco Franco and the Falange, or the Spanish Fascist party. Spanish Fascism led by Francisco Franco and supported by the armed forces of Italy and Germany, which were helped out by the financial and material support of the financial Bourbons of France, Great Britain and the United States, extinguished the Republic of liberal Spain in 1937. Loyalist Spain, the duly elected Government of the Spanish people with over $700 million in gold in its treasury, was unable to buy arms or military supplies with which to defend itself. Of all the nations only Russia came to the aid of Loyalist Spain. United States, acting contrary to international law, in 1936 placed an embargo on the sale of arms and military supplies to the Government of the Spanish Republic and yet at the same time it permitted some of the largest corporations in the United States oil industry to become the chief suppliers of fuel to Franco's Fascists. One of our largest automotive corporations, through its subsidiary export corporation, became the chief supplier of thousands of trucks and automotive vehicles to Franco's army while our State Department refused to grant an export license for the shipment of

a Chevrolet sedan from United States to Barcelona, Spain (Loyalist), for the stated reason that one lonely Chevrolet sedan landed in Barcelona could by stretching the imagination be converted into a war vehicle.

It is interesting to note that United States had a Presidential election in November 1936. It is also interesting to note that Papal Secretary Pacelli visited this country and the White House months before the National Election and approximately at the same time that President Roosevelt declared an embargo on the sale of arms to Spain. It is again interesting to note that President Roosevelt and the Democratic Party were returned to power in November 1936 with the greatest majority vote in the history of American politics. Franco's Spain became firmly established as an ally of all the reactionaries of the world of international finance, an ally of international corporate business and the religious internationalism of the Vatican, and a signatory to the Anti-Comintern Axis Pact of Fascism. In 1937 Japan, after completing its occupation of Manchuria, attacked China. The annexation of Austria and the absorption of Czechoslovakia were but incidents in the same world pattern of Fascism.

From 1934 to 1941 international business promoted, sold, shipped and delivered a continuous stream of scrap steel, oil, rubber, copper, nickel, lead, zinc, asbestos, cotton, copra, antimony, and arsenic to the ports of Japan, Spain, Italy and Germany. During this period many of the great leaders of corporate enterprise waxed fat from the profits of underwriting and supplying the materials for the creation of the Fascist war machines of Europe and Asia. Fascism in Europe and Asia was created as a worldwide conspiracy by the international clerical hierarchy. It was highly profitable business, this international game of supplying the sinews of war for the Fascist armies of Europe and Asia. It has been even more profitable business to produce the sinews of war of United States, Canada and Great Britain and Lend-Lease for the defeat of the Fascist armies.

Great Britain and her ally, France, declared war on Germany on September 3, 1939 when Fascist Germany invaded Fascist Poland. France in 1939 was the hollow shell of a nation rotten to

the core with Fascist intrigue. The Cagoulard, the Croix de Feu, the 200 families of France, the Roman Catholic hierarchy, the French general staff and the officer class, French business, big and little, were all alike militant pro-Fascist. One of the great lies perpetrated by the Fascist press and widely accepted in Canada and United States was that French labor and French radicals were responsible for the collapse and downfall of France. Marshal Petain, Pierre Laval, Diplomat Peyrouton, Administrator Boisson, Pucheu, and Cardinal Suhard are but a few of the more prominent of the millions of the French nation who were active Fascists and collaborators. General Charles de Gaulle heads the Provisional Government of France. The De Gaulle leadership, while it has constituted a rallying point for military action of the French people, sponsored originally by Churchill and his Tory conservatives and belatedly by Washington, has yet to prove that it will not revert to the Fascism latent in De Gaulle's social background. De Gaulle was a staff officer under Marshal Petain in the last war and later served under General Weygand in Poland as part of the French military assistance to the Poles in turning back the Bolshevist hordes in 1920. General Charles de Gaulle comes out of a social background in France whose members have constituted the bulk of the leadership of French Fascism until June 6, 1944. Only the future will portray the true picture but it is safe to say that, if the new France is able to stage a revolutionary renaissance and a complete divorcement from her previous Fascist collaboration, it will be in spite of the leadership of De Gaulle and not because of it. It will be because new forces will have been generated within the French nation, within the people themselves, that will compel De Gaulle and his clique in the Provisional Government of France to bow to the inevitable or suffer political liquidation.

Belgian royalty and Belgium's best families sold out Belgium to Fascism as slickly as did their brethren in France. One must never forget that when General Korab, commander of 250,000 veteran soldiers (not conscripts) of the 9th Corps of the French Army, surrendered without a fight to the Germans at the Sedan

Gap, the end of the Maginot Line, the fall of France became inevitable. So too, when King Leopold and the Belgian Army surrendered to the Germans a little later, the debacle of Dunkirk became inevitable.

Clerical Fascism had permeated and ideologically conquered the national structures of Italy, Germany, Austria, Hungary, Czechoslovakia, Poland, France, Spain, Portugal, Belgium and Ireland before the spring of 1939. It had seduced and corrupted the ruling structures of Romania, Bulgaria, Greece, Yugoslovia and Finland at the same time. Simultaneously with this achievement it had succeeded in winning public favor and approbation and open-voiced support from Tory conservatives and better business in Great Britain, Canada and the United States. It had also succeeded in firmly implanting its doctrines and ideological leadership in the countries throughout the Latin world, through its paid export and subsidizing by its agents of business and finance and the trained emissaries of the Espana Falange. The Falange permeated the Philippines and every Latin-American country from the Rio Grande to the Tierra del Fuego. In the history of the struggles and conflicts of the nations of the world, Fascism will have achieved the greatest ignominy of all time in that it has permeated more nations with treason, sabotage, mass murder and the sadistic torture of millions, all for the one purpose of creating a militant holy crusade for the suppression and destruction of social change.

Within the next few days the last organized military effort of European Fascism will be blotted out by the military might of the Allies. The San Francisco Conference will be staged at the Golden Gate on April 25 with all the tinsel trappings of international Hollywood ballyhoo. It will be extolled as the great meeting of nations coming together to found an organization which will enforce peace and security for all the nations of the world forever and forever, Amen!

The United States State Department, in collaboration with 10 Downing Street, London, with Paris and Rome, has succeeded in applying such a volume of the whitewash of international absolution to the black Fascists of Argentina that they have now grown the appropriate halos of good

neighbors and the golden wings of democracy, just in time to spread those wings at the San Francisco Conference, provided of course that Russia doesn't object. When all the fighting in Europe is for all practical purposes done for, all one has to do to be admitted to the United Nations is to technically declare war on paper against Germany and Japan. Last minute efforts are being made to have Italy declared a co-belligerent. No doubt Italy will declare war on Japan and this would entitle the birthplace of Fascism to be an honored member with full voting rights at the Golden Gate. Spain and Portugal, it is not too late, for even in the last hour you will be able to enter our Father's house, if you too cleanse your souls! Of course it logically follows that, if Japan were to declare war on Germany and Germany were to declare war on Japan, it would constitute **prima facie** evidence of their good intentions and therefore they too could add their voices to the hallelujahs.

What a conglomeration! Never has there been such a collection of international vultures. Let us list the nations represented at the San Francisco Conference and emphasize the black vultures of the peace in **bold face:**

Australia
Belgium
Bolivia
Brazil
Canada
Chile
China
Colombia
Costa Rica
Cuba
Czechoslovakia
Dominican Republic
Ecuador
Egypt
El Salvador
Ethiopia
France
Greece
Guatemala
Haiti
Honduras
India
Iran
Iraq
Lebanon
Liberia
Luxembourg
Mexico
Netherlands
New Zealand
Nicaragua
Norway
Panama

Paraguay
Peru
Philippines Commonwealth
Saudi Arabia
Syria
Turkey
Union of South Africa
Union of Soviet Socialist Republics
United Kingdom
United States
Uruguay
Venezuela
Yugoslavia

The Big Four, Great Britain, United States, China and Russia, constitute the sponsoring nations for the San Francisco Conference. Leaving aside the 'Johnny come lately', Argentina, there will be nineteen nations from Latin America attending the conference. Great Britain, France, Canada, Belgium, Netherlands, and United States have welcomed Argentina back into the official family of nations by extending diplomatic recognition which had been withdrawn for some time. Argentina has therefore technically complied with all of the requirements for attending the conference at San Francisco. This would make Nation No. 20 from Latin America. Mayor LaGuardia of New York and Representative Mercantonio have petitioned Washington to have Italy declared a co-belligerent and attend at San Francisco. Even Spain has broken off relations with Japan, but, leaving Italy, Spain, and Portugal out of the conference guests for the moment, we will pass on and include France, Belgium, Luxembourg, and the Philippines which, added to our previous twenty, brings the total to 24. These 24 nations are Roman Catholic in religion and have been satellite nations in the international orbit of Vatican policy. Of these 24 nations only three have been invaded by the enemy, Belgium, France and the Philippines. Fascist infiltration was the chief cause of the downfall of Belgium and France, and a contributing one in the Philippines. Only one other of these countries, Brazil, has indulged in an active military participation in this war and then with only a token contingent of Brazilian troops on the Italian front.

Great Britain, Canada, Australia, South Africa, India, and New Zealand comprise the six votes of the British Commonwealth bloc. The Russian bloc includes Czechoslovakia and

Yugoslavia. The United States, China, Norway, Netherlands, Greece and Ethiopia are all that are left of the attending nations, exclusive of the Mohammedan group. What a kettle of fish!

Great Britain, United States and Russia will be the three great military powers of the world upon the downfall of Germany and Japan. If the three all powerful conquering lions of the world cannot maintain peace and security, then forty jackals that rush in at the kill to devour the carcass will not be able to create world peace and security.

World War II is a total war militarily and ideologically waged by one set of nations supporting one policy against another set of nations supporting another policy. This war is a world conflict between two opposing policies. There have been and there are only two policies, Rome and Moscow, and all participants are allies of one or the other. How can you expect anything but an international double cross to come of San Francisco when the majority of nations invited are allies of the policy of Rome?

The United Nations conference in San Francisco has been called for the avowed purpose of having the representatives, delegates and advisers of the United Nations assembled to confer, discuss, and decide upon the design and construction of a permanent international organization for securing permanent peace. The United Nations conference at San Francisco is not a peace conference. It will not lay down and determine the conditions of peace of World War II. It will not fix boundaries and allocate territories neither will it determine any war reparations. It will however erect on paper an international assembly of sovereign nations to be governed in theory by the common consensus of the majority; in actuality, to be controlled only by the coordinated agreement of the Big Three. To put it mildly, if the Big Three cannot agree among themselves, all of the lesser powers combined could neither prevent disagreement nor compel agreement.

The apparent purpose of the United Nations conference may be described as a laudable ideal internationalism but, in spite of this idealism, there lurks the deep suspicion supported by incontestable evidence that the underlying purpose of the San Francisco Conference is a smooth and well

laid conspiracy of the Fascist majority of the United Nations to mobilize world opinion against Soviet Russia so as to counteract the defeat of Fascist Europe and Asia. This conspiracy is predicated upon the fundamental assumption that its success is dependent upon perpetrating a state of war between this country and Soviet Russia. The machinations of the Fascist intriguers within the ranks of two of the Big Three have already created a dangerous crisis in the relationship between United States and Soviet Russia. If these machinations are permitted to continue, an open breach is inevitable in the near future.

—CHQ, Technocracy Inc.

EDITOR'S NOTE: *This article was released by Continental Headquarters of Technocracy Inc. on April 8. Since then the San Francisco Conference has followed closely the predictions made on that date.*

The San Francisco Conference

IT IS TIME the American people became aware of what is really going on in San Francisco. On the public plane a charter is being written for a stable peace. But in private too many members of the American delegation conceive this as a conference for the organization of an anti-Soviet bloc under our leadership. And it is no exaggeration to say that not a few of them are reckless enough to think and talk in terms of a third world war—this time against the Soviet Union. That this is the basic pattern of the United Nations Conference is the conviction not of myself alone but of many astute American and foreign correspondents here and of progressive members of the American delegation and its entourage. If this is kept in mind, it will be easier to understand the Argentine and Polish issues, and to be forewarned and forearmed against a rightist turn in American Far Eastern policy and a softer attitude toward the future of the Reich. If this dual aspect of the San Francisco Conference is brought forcibly to public attention, it may yet be possible to stem dangerous undercurrents which have the gravest potentialities for the future.

—I. F. Stone in The Nation

'There'll Always Be an England'

The United Kingdom is fast retrogressing from its position as the possessor of easily available energy to its next most probable energy state as two islands off the coast of the European continent. A valiant race, fighting a losing battle, is displaying an admirable fortitude in the crisis that is resulting from excess population, declining resources, and obsolescent equipment operated by the antiquated methods of a Price System. —HOWARD SCOTT (1932)

IN World War I it was the prevailing practice to divide the nations of the world into the simple classifications of major and minor powers. A major power was generally agreed to be a national entity that could in the time of war mobilize an armed force of one or more millions as a land army in conjunction with a certain degree of naval power and sufficient agricultural and industrial production and transportation facilities to supply and maintain its armed forces in any military conflict in which it might become engaged.

In 1914 Great Britain, France, Germany, Austria-Hungary, Italy, Russia, Japan and United States constituted the major powers of the world. In 1920 Austria-Hungary had disappeared from the ranks of the major powers. Germany, although defeated in 1918, had retreated with its banners flying, its general staff, officers and cadre units intact and, while technically disarmed by the Treaty of Versailles, it was nevertheless in the matter of trained personnel, population, agricultural production and industrial potential classified as a major power. Russia, although torn by invasion, defeat, civil war, revolution and famine, was still too in the category of a major power.

The end of World War I found most of the major powers, victor and vanquished alike, equipped with a greater industrial capacity and potential than when they entered the war in 1914.

Now, 27 years later, as World War II draws to its close in Europe, let us survey the scene. How many powers will remain in the category of the major classification when the conflict ceases? At the end of World War I, Great Britain, France, and Italy, the victorious powers, possessed large and well trained vet-

eran land armies and naval forces. Even vanquished Germany in defeat still possessed a competent and formidable military force in her land army. Today, in 1945, will the situation at the close of the conflict bear any relationship to that of 1918? Where is the 'Grand Army' of France, the great military force of Italy, the mighty BEF, and the millions of defeated Germans?

France, defeated and overrun in 1940, had never recuperated from a military standpoint in its population growth from its terrific losses of manpower in World War I. France lost over 2,000,000 of her armed forces as prisoners of war. These prisoners of war have been incarcerated in Germany in concentration camps or at slave labor. Besides the prisoners of war, some 700,000 additional numbers of French manhood were drafted as slave labor into German work battalions. Five years as a prisoner of war or as a slave laborer suffering from overwork and malnutrition in a foreign country has depleted the normal birthrate of France and it is obvious that the death rate of these 2,700,000 Frenchman would be greater than that existing in peacetime conditions in their native France. It is therefore obvious that the effective military potential of postwar France is further reduced below that of 1939. It is well to remember here that, when we speak of the military power of postwar France, we are speaking of the probabilities of creating an armed force from the manhood of France. This does not include the black Senegalese of French Africa, the yellow Tonkinese of French Indo-China, or the possible colonial conscripts of French Algeria and Morocco. France at the end of World War II will be a long way from having sufficient military power to be classified in the major category.

The armies of Italy have melted away on the plains of Russia, the Balkans, Albania and Africa. Defeated Italy will no longer have an armed force of sufficient importance to be classified as a military power.

The great armies of Fascist Germany are in Russian prison camps or lie buried in Russian soil and the lesser remainder that have been captured by the armies of Great Britain, France and United States. Germany in 1945 will have no fighting army as it did in 1918. Its entire mili-

tary force will have disappeared.

Only Britain and Soviet Russia of the European major powers will remain with armies of any size and in the classification of major powers. The Army of Soviet Rusia will exceed by several times the entire remainder of military armed might in Europe.

Great Britain, like France, was never able to recover her military losses of manpower in World War I. The total casualties of World War II will further impair the military position of Great Britain. The question which comes to the fore and which the Continent of North America and the world must face can be simply put: Will Great Britain be a major military power in the Europe of tomorrow? Great Britain with 47 million population has the high density of population of 495 per square mile. Can we expect Great Britain to increase its population much beyond its present total? Such expectations could only be realized provided the British Isles possessed energy, mineral, and agricultural resources great enough not only adequately to maintain its existing population but to provide for expansion of the future. Prewar Great Britain was able to produce only 40% of the foodstuffs that it consumed.

Prewar Great Britain in its most productive years was able to produce between 240 and 260 million tons of coal annually. Great Britain under the emergency powers of war, the conscription of labor for coal mining, and the help of huge open pit mining machinery imported from United States, was able to produce only 193 million tons of coal in 1943. British coal production has declined 9 million tons annually since the start of the war in 1939. Britain, that once was the great source of tin for the Mediterranean civilization, no longer is a producer. British copper production has long since ceased. British iron ore has been in continuous decline. Great Britain during the war has been mining iron ore with an Fe content of 23 to 27%. With such an iron content per ton it would require five or more tons of iron ore and a like amount of coal to produce a ton of steel.

The imperialist expansion of British mercantilism was based on the adequate resources, and their availability, of high grade steam and coking coal and rich

iron ore. The tin is gone, the copper is gone, and the coal mines are going deeper and deeper and farther out and under the sea. The iron mines are going deeper, and the ore is becoming poorer. Do not misunderstand us, there will always be coal and iron and other ores in Great Britain but those ores will lie in sweet repose below the 7,000 foot level, the depth at which the law of diminishing returns becomes the arbiter of a nation's destiny.

Oil has been discovered and brought into considerable production in Britain but the future of British oil production can in nowise be viewed as rescuing the fuel resource situation of the British Isles because the oil surveys show that the oil fields mapped, both actual and potential, by drilling and geophysical surveys, are of a minor order of productive capacity when viewed in the terms of world oil.

Britain does not produce cotton. British wool production is insufficient to meet its internal needs. British production of lumber is totally inadequate to meet the requirements of British consumption. Britain can produce pulp only from imported material. Oil, fats, foods, minerals and other materials must be imported into the British Isles. Can Great Britain hope to compete in the international markets of the world with the ever increasing costs of her declining resources even in the manufacturing and fabricating from imported raw materials?

Prewar Great Britain averaged £866 million in imports annually and her exports, visible and invisible, amounted to £826 million; a net loss of £40 million of imports over exports. Great Britain has for a number of years been meeting this annual deficit in export-import balance by the deinvestment of her capital holdings abroad. Included in the £826 billion annual average prewar exports of Britain is £478 million of physical goods, but the figure of £478 million includes £90 million of imported foreign material, so the actual net physical export of Great Britain in prewar average actually is approximately £390 million.

Keeping these figures of British exports and imports from the Institute of Statistics at Oxford in mind, let us proceed. During this war Great Britain has been compelled to sacrifice practically all of its investments abroad in

order to meet its war purchases and to keep exchange balances. Great Britain, apart from Lend-Lease and the Mutual Aid program of Canada, has gone into debt on a huge scale in the world of international balances. It is reported that Canada has in its possession within the Dominion 2 billion American dollars worth of British currency at current exchange rates. Great Britain owes the nations in the bloc currency group approximately four billion pounds. Canada is not a member of the bloc currency group.

It is therefore obvious, according to the previously stated figures of British net exports of £390 million a year, that Great Britain is already in hock for her total exports for ten years. Lend-Lease and Mutual Aid are not even included in the above statement. Great Britain, in order to pay off her obligations to the bloc currency group alone and to maintain her previous prewar export status, would have to increase her postwar exports of net physical goods to over £800 million. Has Great Britain the resources and the facilities to double and more than double her production of physical goods for export, and at the same time supply the requirements for internal consumption plus national rehabilitation? The picture does not provide an affirmative answer.

In the face of the facts of the internal situation of the British Isles, Beveridge Plans, Government plans for housing, British cooperatives, Conservative and Labor legislation alike are but gestures of futility. Technocracy would like to recall here that its analysis of British conditions written in 1932 is being carried forward to its inexorable conclusion by the march of events.

The 120,870 square miles of the two islands known as Great Britain and Ireland off the coast of Europe have been the homeland and the focal area from which radiated the naval military endeavors, explorations, and mercantile imperialism which have expanded into the British Empire around the world. In over four hundred years of mercantile imperialism, the British Isles have been dependent upon the energy and mineral resources of their homeland to provide the means whereby Britain could become the great manufacturer, the leader of world trade, the great importer of raw materials from around the world, and the great

exporter to the markets of the world.

The transition from an insular island kingdom off the coast of Europe to that of the British Empire dominating the markets and trade routes of the world has been dependent upon the consumption of British energy and mineral resources in ever-increasing volume. The British Isles had passed their zenith in the consumption of fundamental industrial resources even before World War I. The resource position of the British Isles has been in continuous decline for the last half century and this position is becoming more and more critical as the years go by. Britain faces a resource position of even more drastic decline in the immediate future.

The nations of the other areas of the British Commonwealth of Nations overseas, which were once the dependent colonies of Great Britain and which for centuries were the great suppliers of raw material to the British homeland, have been transformed by area technology from dependents to superior producers and export competitors. Canada, Australia, South Africa and India have transformed themselves from export agrarian economies to export manufacturing economies. These countries are far greater in area than the British homeland and are more magnificently endowed with energy, mineral and agricultural resources, and climatic range.

The policy of colonial expansion of mercantile imperialism can maintain the homeland position only if the colonies larger in area than the homeland are operated by human toil and hand tools as raw material suppliers at low labor costs to the heart of the Empire. When any nation takes over a colonial area greater in size and resources than its homeland and under the impetus of mercantile exploitation proceeds to develop that colonial area by the introduction of technological production in use at home, it will first export capital for investment in its colony. This investment of capital in colonial expansion will proceed for a number of years reaching a zenith and then falling away.

As the export capital is invested in the development and creation of capital goods industries in the colony, the homeland will prosper with greater export trade to the colony. The technological

production of the homeland will require that the colonial area must develop its conversion of energy per capita in order to consume the export product of the motherland. As the technological facilities of the colony are increased, its resources developed and its transportation coordinated, it automatically follows that the larger area of the colony will soon begin to approach and finally pass the mother country in its conversion of energy per capita per day. In the moment of its passing, if not before, the colony ceases to be a dependent of the mother country and becomes a more virile, more competent producer and exporter than the homeland.

Great Britain has arrived at this position in her physical relationship with her dominions overseas. The question every subject, or every citizen if you like, of the British dominions overseas should squarely face is how long can the British dominions overseas continue to provide the physical resource support for the operation of the British Isles. The British Isles, if socially reorganized under a technological control, can provide a high standard of living for 15 to 20 million total population over an extended period. If the British Isles attempt to maintain their present population or to increase it, they face a future of decreasing standards of living, rising population pressure, and greater poverty which can be solved only by the export of Britain's surplus population overseas. It is with this in mind that Technocracy advocates that the Dominion of Canada grant immigration preference to 35 million British subjects.

No people in the world are entitled to more respect and admiration than the people of the British Isles have gained through their display of outstanding fortitude, courage and tenacity in the face of national adversity. Unfortunately, no nation however courageous can recoup its declining resource potential by the morale of its heroic citizens. Technocracy's analysis must not be interpreted as being in any way an expression of antipathy or opposition to the people of the British Isles. It is an analysis of physical factors presented to inform the people of this Continent, and as a matter of concern for the people of a nation who are our closest relatives in tradition, blood and language. **—CHQ, Technocracy Inc.**

The Age of Alchemy

This article is one of the finest to appear in any Price System publication during World War II. It backs up Technocracy's analysis of the economic situation that confronts North America and the World Keep the preceding article in mind when reading it.

STATED simply, the one most important institution in our complex scheme of material civilization—universal in it—is breaking up before our eyes. World War I rocked it to its foundations; World War II may well finish it. The name of that institution is international trade.

People will always be free, we suppose, to exchange with one another unlike and unique goods, and may find endless satisfaction in doing it. What we speak of here is international trade regarded as a necessity.

In its origin there was no element of necessity, or hardly any, except in special regional cases. The spirit was adventure, the motive was profit, the method was one of ruthless exploitation of the innocents. The fact of necessity evolved, and as it evolved the profit declined, until profit alone—private profit—was not enough to sustain it; whereupon governments began to take foreign trade out of the hands of private traders to control it for political ends and to subsidize it with public funds, because at last the necessity had become vital, and was of this kind:—

First, that a people who had abandoned agriculture for industry were obliged to import food and raw materials in exchange for manufactured goods, in order to live.

Second, that as the machines of the industrial nations multiplied, the output of manufactured goods came to be more than could be absorbed by the people who produced only food and raw materials and had generally a low standard of living. Then came the specter of surplus and unemployment in the industrial nations and the struggle among them to sell their similar and competitive machine wares in one another's markets. At the same time, each put up tariff barriers against the others; that is to say, each was

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trying to invade the markets of the others while desperately defending its own.

At the beginning of the modern machine age, Adam Smith, writing on the uses of foreign trade, said: 'The land and labor of Great Britain produce generally more corn, woollens, and hardware than the demand of the home market requires. The s u r p l u s part of them, therefore, must be sent abroad and exchanged for something for which there is a demand at home. It is only by means of such exportation that this surplus can acquire a value sufficient to compensate the labor and expense of producing it.'

This was about 1776. If we have the faintest idea of what the standard of common living was at that time in England, we know that there was no surplus of human satisfactions. The same labor, land, and capital that produced what Smith calls a surplus might have been employed to produce more of the goods people wanted at home instead of goods they had to send away. At least, that was true then. We know also that the goods they sent away did not all come back in the form of things the people wanted; a great part of what was exported took the form of investments in foreign countries—tramways, railroads, docks, London facades in Shanghai and Hong Kong.

The kind of trade Adam Smith was talking about was trade for profit, and the profit was so great that England sacrificed her own agriculture to industry. In a little while there was no surplus corn to sell (corn in the Old World meaning small grains, not maize). Instead, she found herself importing not only the materials of food for human consumption but the raw materials her machines devoured. In a little while more her 'umbilical cords' ran to every part of the world; and since these cords were vital to her preferred way of existence she had to protect them. In order to protect them she had to control the seas.

The system worked very well and was wonderfully profitable so long as she had what amounted to a world monopoly of machine craft. The first nation to threaten that monopoly was Germany. The second was the United States. At the outbreak of World War I, these were the three principal industrial nations of the world; Japan was coming.

One effect of the war was that

the machine went migrating. Every intelligent nation wanted machines of its own, because, in the first place, it was seen that a nation with no industrial power of its own was helpless in time of war, even as a neutral; and, secondly, there was no longer any doubt that a people who produced only food and raw materials for export, and exchanged them for manufactured goods, tended to become fixed in the inferior economic status, with a low standard of living. Thus, new machine industry became apparitional all over the world; and no sooner had a country found its own way with machines than it began to want markets for a surplus of competitive machine products and a favorable balance of trade.

At a luncheon in London, Lord Astor turned to me, saying: 'Do you know, as a result of the war many countries now have industries that are not entitled to have them.' My answer was to ask: 'How does an Englishman determine what countries are entitled to have industry?'

Besides the countries that now had industries of their own for the first time, the three principal industrial countries had enormously increased their capacity during the war, especially Germany and the United States; and meanwhile, Japan had arrived.

Such were the conditions under which Great Britain argued that even if she could afford to pay her war debt to the United States Treasury, we could not afford to receive payment. Why was that? Because she would have to pay us in competitive industrial products—in textiles, machinery, and hardware; and if we took such goods from her, what should we do with the American labor that was employed in producing like goods—not only enough for the American market, but a surplus for sale in foreign markets? If she should sell her goods elsewhere in the world to get the money to pay her debt to the United States Treasury, it would come to the same thing, for she would be taking away our customers.

What we did was to raise our tariffs against all foreign manufacturers, those of England included, to keep them from displacing American goods in the American market; and then we loaned Europe eight or ten billions with which to buy the surplus product of American industry. All of those billions we lost.

Worse still, a very large part of what we loaned to Europe and lost there in the 1920's was used to increase the industrial capacity of Europe, both in countries that had industry before, like Germany, and in others like Poland and Czechoslovakia. We were buying competition for ourselves.

And yet, because the political and financial ruin of international trade was an event the world was not prepared to face, all this immense absurdity was passed over.

The idea of economic self-containment now runs in bad company. It is associated with political isolationism. But we are not discussing self-containment as an idea or an ideal. We are trying to look at what has happened to international trade, and at the impending ruin of it; and if this does at length force the world into several great regions of self-containment, the people inhabiting those regions need be no more isolated from one another than farmers who lived side by side on the kind of farm plot that once was natural and ideal, beginning at the stream and running to the top of the next hill. Each farmer had, therefore, water, pasture, lowland, upland, and on the hillside his woodlot. But he was not, by reason of this perfect self-containment, isolated from his neighbors.

With the profit gone out of it, and with the supply of docile people willing to perform the drudgeries of its primary production coming to an end, one would say that international trade had outlived itself; but one would say also that if the necessity for it were vital a way would be found to go on with it. Let it be a question of survival for the industrial people, of living or not living, and such a thing as profit really does not count.

But if the vital necessity is in a state of decline, tending to disappear, then the ruin of international trade as we have known it, and as we continue to think of it, is very clearly indicated. The startling premonition that this may be so has its strange occasions.

Not long before Pearl Harbor, reflecting on what might be the next state of the world and what we should do with a conquered Japan, I was turning the pages of the **Japan Times Weekly**, especially the advertising pages, for it was a number devoted to foreign trade, and there were the

things Japan was going to make and sell all over the world at competitive prices, save in Asia: she would enclose Asia from competition in order to sell them there on her own terms. What things? Well, all the things she once bought from the machine people of the West before she learned how to make them, first for herself and then for export. And these are the things, moreover, that the Western machine people still want to sell in the East: for example, machinery, tools, hardware, electrical equipment, glass, perfumes, pharmaceuticals, chemicals, motorcars, garage equipment, guns and munitions, typewriters, plastics, rayon, cotton goods, agricultural implements, surgical instruments, optical goods, engines of all kinds, tires and rubber goods, wire cable, leather belting, and so on and on. And for nearly all these things Japan has to think first of importing the raw materials.

In the same number of the magazine there was a continuing discussion of the Greater Asia Coprosperity Plan. Under this plan the inferior people will be the hewers and drawers—and the 'inferior' people are all others than the Japanese. Thus, from China, there will come to Japan coal and ore; and perhaps the culture of the silkworm, as seeming now to be below the dignity of an overlord people, will be transferred from Japan to China. From what was French Indo-China, rice, corn, and rubber will come to Japan. From Thailand, rice, rubber, lumber, and lac. From what were the Dutch East Indies, rubber, sugar, tea, tobacco, copra, and oil. From the Philippines, sugar, hemp, tobacco, and more lumber. Food for the Japanese and raw materials for their machines. Five or six hundred millions of Chinese, Javanese, Malays, and Balinese performing the tasks of primary production for ninety millions of Japanese; and for the Japanese, industry, banking, shipping, administration, profit, power, empire.

There is nothing new in this plan, save only that it is Japanese—that is, it is Japan doing to Asia what the West did to the East. Nor is there anything new in the naive Japanese words: 'In this way the relationship will become one of give-and-take, and will benefit both parties.'

But there was a Japanese editor, too, thinking his own thoughts, as an editor sometimes

will; and suddenly all this grand thesis collided with something the Japanese propaganda bureau had not put in his mind—namely, the premonition we spoke of. He did not intend this to happen. It was as an accident. He was writing an editorial about what would happen to Japan if the United States stopped buying her silk, and he said, defiantly: 'As the United States believes it is ready to do without much or most of its silk, by the substitution of nylon, this country also has to learn to do without some of the things which silk dollars could buy. Synthetic methods are not confined to one country.'

And from there he went headlong to the accident. 'The growing power of chemistry,' he said, 'is doing much to provide the have-not countries with the products they need, even as Germany has been able to make a synthetic rubber of great practical value, whose quality is improving monthly. No research or manufacturing chemist today would hesitate to predict that most countries, in a not too distant time, will be able to find all the essential things in their own back yards. There will be merely the necessity to pass soil and rocks through machines or processes for the recovery of wanted materials. The outlook offers a distant solution to the problem of international trade. It should not be necessary for a country, in order to live, to send its manufactures to distant lands or to import the necessities.'

Now what had he said? If it were true, then neither the China affair, as they speak of it, nor the contemplated total conquest of Asia and the South Pacific which was about to begin, could be regarded as a rational adventure. There was pride of idea in what he had written; he believed it. Yet what would the censor say?

Therefore he added this: 'Japan in due time will have to find her opportunities within her own economy, but the situation today demands interim measures such as the government is working out.'

Here is, perhaps, the strangest thing that was ever defined: an interim war; a war belonging not to the future but to the past; a war not to perpetuate international trade but only to keep it alive for a while.

This consternation of doubt, taking place in the mind of a Japanese editor, is merely a vivid

and unexpected exhibit. The economic thought of the world is in the same way stultified. When the war is over, shall we have to scrap our synthetic rubber industry, keeping only a few plants to remember it by in case we need it again? And if so, why? In order that we may go on buying natural rubber in Asia, for unless we do go on buying rubber in Asia, instead of making it for ourselves, it will be very bad for international trade and ruinous for the people of Asia who have learned to live by rubber—to say nothing of our friends, the Dutch and English, who own the rubber plantations.

We can now begin to make out dimly the economic evolution that is taking place. We are passing from the age of machine techniques to the age of alchemy. It is a momentous event. Future and past are in conflict. One remembers the saying of Walter Bagehot, on history, that many times it had seemed that people were about to make a great step forward, they had prepared for it, they knew what they were doing and where they were going; then they had looked back, and did not advance.

If one takes the Anglo-American projection to be authentically represented by the Atlantic Charter, the system of lend-lease agreements touching the world that shall come after, the Hull Doctrine, the apocalyptic economics of Henry Wallace, the guilt theme of Sumner Welles, the Report of the London Chamber of Commerce on the General Principles of a Post-War Economy, and what may be called the British Confession by Sir Stafford Cripps, one will see that it begins with contrition and proceeds from a certain assumption as to what was wrong with the world before. Those who mainly controlled the raw-material resources of the earth were too selfish, too much concerned with their own profit, too unmindful of the needs of others. That was wrong. That was why international trade became a moral and economic nightmare. Hereafter it must be different. Nations must learn to think not only of themselves but of one another, too; and all people must have access to raw materials and markets according to their needs.

All of this, says the other side, is Devil's holy water. The aggressor mentally assumes that those who control the sources of

raw material will be selfish and heedless. What is possession for? Sources of wealth are not to be shared. They are to be exploited by those who are strong enough to take them.

But what is left out—missing both from the Anglo-American projection and from the brutal aggressor thesis—is the fact of economic evolution.

As we pass from the age of techniques to the age of alchemy —if we do—we shall cease to think of raw materials as deposits of solar energy that must be dug out of the earth's crust, or as a kind of plant life that will flourish only in a certain place. The sources will be such as no one can conquer, possess exclusively, or exploit selfishly.

In forgotten textbooks, one finds that less than a hundred and fifty years ago the political and economic thought of the world was sunk in gloomy meditation on the food supply. A man named Malthus had written a treatise in which he demonstrated what was then a fact—namely, that population in a natural way tended to increase much faster than the food supply. The number of arable acres was a limited quantity, not by any means increasable, whereas the impulse of the human species to reproduce itself knew no limit. If this were true, then the human race was doomed to be limited by a tragic fringe of misery and starvation, unless it could think of a way to limit itself by continence. The reason no one could reason away this doctrine of Malthus was that no one could imagine what was going to happen.

It was not that vast areas of virgin land were opening, as in North America; there would soon be an end to that and the situation would be again as it was, according to the Malthus formula. Primitive agriculture was passing; scientific agriculture was coming. Knowledge was increasing. The application of scientific thought to agriculture, plus modern transportation, so increased the power of man to bring forth food from the earth and to make it available that in the hundred years after Malthus population increased as it had never increased in any century before; and the more it increased, the more food there was, to the absurd point of surplus.

From this unpredictable solution of the food problem there was a tremendous release of

human energy. The measure of it may be imagined from the fact that in two generations the amount of human energy necessary to be spent in agriculture fell at least one half. That is what made the industrial age possible. Otherwise it could not have arrived. The labor for it could not have been spared from agriculture.

But with the rise of modern industry appeared a new kind of food problem. There was a new stomach to fill. Machines had to be fed. They devoured raw materials insatiably. And as it had been once supposed that the human food supply was limited by what the art of primitive agriculture could produce from an inexpansible number of acres, so, when we began to worry about enough raw materials to feed the machines, it was supposed that the supply of these was limited, too. A coal mine here, an oil well there, a kind of tree that would flourish only in a certain climate—and whoever owned the coal mine and the oil well and the area where the tree grew could feed their own machines and starve the machines of rival people. So there came to be a Malthusian doctrine of raw materials, and it was implicit in the power politics of the world.

Like the original Malthusian doctrine, this one was true in the making—true, that is to say, in relation to the then state of knowledge. Today it is true mainly for the reason that we continue to think and behave as if it were, war being one form of that as if behavior. In a little while, if we advance, not only will it not be true: it will be remembered as a superstition. Already we know better. The disparity between what we know and what we do is the supreme tragedy.

Liberating knowledge—it is scientific knowledge we speak of—does not come as revelation. It grows by accretion. Its beginnings very often seem frivolous.

What happened to the ivory trade? Man wanted more and more ivory, especially for billiard balls, and the supply was failing. It would not pay to cultivate elephants for the tusks; besides, it was perhaps impossible ever to get enough that way. Where did ivory came from? Not from the elephant, really, but from what the elephant ate. What the elephant ate was grass. Therefore ivory was from grass. The elephant was merely a natural

chemical works, converting something that was in grass into a thing called ivory. Even then one might have been sure that when the demand for more ivory, or for something that would do in place of it, became very urgent, so that the incentive was high, a brooding chemist would begin to think like that and end by finding what that something was, in the grass the elephant ate, that made ivory. At any rate, that happened. He found it. And then it was possible to do purposefully in an artificial laboratory what the elephant does naturally without knowing how. After that there were plenty of cheap billiard balls.

Such, very roughly, was the beginning of plastics, and yet it is only now, under stress of necessity, that we perceive the possibilities of plastics in structural uses, in place of natural raw materials like iron and lumber. Now we begin to see plastic automobiles, plastic airplanes, plastic houses, even to imagine plastic cities and to speak of the plastics age, as once we spoke of the iron age and then of the steel age. And the source of this amazing, versatile material is as free and as wide as air and sunshine.

For many years one of the great driving gears of the international trade machine was named textiles. The people who had invented and perfected textile-making machinery, especially at first the British, imported the raw fibrous materials, such as cotton and wool, made them into cloth, and exported the cloth to all parts of the world. Among the principal buyers were those who produced only the natural fibers and made no cloth for themselves. Anyone looking at this situation might have believed it was permanent. It represented a division of labor between peoples—those who had the suitable areas and climate to produce the fibers and those who had the textile machines to make the cloth. One result was that the common kinds of cloth were very cheap. And how else but by this division of labor and this exchange could the world be well and cheaply clothed?

Then the meddling chemists, with nothing better to do, and only to see if they could, found a way to make textiles without natural fibers—that is, without wool, flax, cotton, or silk. They could make it out of a chemical mess that lay at the cellular base

of all plant life; and as they went on, they found they could make it out of coal and air and water, or out of sand. But they needed a machine, too; and impish mechanics obliged them by inventing a machine that is in fact an immense silkworm, to spin their sticky stuff into threads.

For a generation we have been staring, with a kind of stupid wonder, at the prodigious rise of the artificial textile industries, loath to accept the economic implications; so loath, in fact, that governments have subsidized with public funds—what? Not the artificial textile industries, but the culture of natural fibers, like cotton, because the producers were being damaged by the competition.

Until World War I, the first anxiety of any nation thinking of war was about nitrates. Without nitrates high explosives could not be made. The one natural source of this essential material in great quantities was a rainless Chilean desert on the western side of the Andes, where for many ages bird guano had been deposited until there was a bed of it two miles wide, two hundred miles long, and five feet deep. Before World War I, both Germany and England accumulated great piles of this Chilean guano, but not enough. No sooner had they begun to shoot it at one another than they realized that they had greatly underestimated the amount of high explosives they were going to need. The German Navy tried to blockade the Chilean coast, to keep England from getting any more. The British Navy had the same thought at the same time, and won.

Yet all of this was time and energy wasted. When Germany was cut off from the Chilean nitrates, she remembered that her scientists knew a way of filching nitrogen out of the free air. They got from the air all the nitrates they needed for the duration of the war, and since then all nations have been getting their nitrates from the air.

Only two or three years ago it would have seemed that a plan of grand strategy for a mechanized war could be based on rubber alone. No nation without rubber could go far with mechanized warfare. Its system of motor transport would break down. Indeed, Japan's strategy was aimed at getting control of the rubber of Asia. Her success in cutting off both the United States and

Great Britain from their principal sources of supply might have been for us a major military disaster. But fortunately, we already knew how to make artificial rubber. We had never done it, but we had the formulas, the chemical knowledge, and the materials. What materials? Petroleum is one. Alcohol is another. Petroleum comes out of the ground, and we happen to have more of it than anyone else in the world. But alcohol comes from wheat or corn or potatoes or cane. We can plant and reap it, as much as we need, and so can anyone else. We are going to use both for making rubber; and if the war continues for a year more—that is to say, if the necessity continues—we who were the largest buyers and consumers of rubber from Asia need never buy another pound of it there.

In the same way, a plan of grand strategy might have been based on oil. That in fact was done many times. There was a world struggle for oil. Possession and control of its sources was the great aim of power politics. Before oil it was coal. For nearly a century Britain's superior coal measures were one of her four aces in the game of foreign policy.

Why are coal and oil so important? Because they contain and can be made to release solar energy that was caught and turned cold in the crust of the earth millions of years ago. One is solid. The other is fluid. They are so much alike in chemical nature that both can be made to do the same work. Yet neither coal nor oil is a source of energy. They only store it. The source is sunshine.

What so suddenly invested petroleum with its supreme importance was the arrival of the internal combustion engine. Motor transport and aviation both rest upon it.

Imagine, then, that all the oil wells of the world go dry. There is no more petroleum. In that event, should we have to abandon the internal combustion engine? Should we lose the power of wings and fall out of the sky? Not at all. Two things would happen, both of them relatively simple. The engineers would redesign the engine, and for this redesigned engine the chemist would design the fuel.

You understand, of course, what it means to say the engineers would redesign the engine.

They might have to change the length of the piston stroke and the diameter of the cylinder and modify the carburetor, and so on. But do you understand so well what it means to say the chemist would design the fuel? Mark it. For upon that one point the age of alchemy revolves.

Hitherto man has acted on the outwardness of matter as he found it, not upon the inwardness of it. That is to say, he has accepted matter in its natural forms as nature left it, and has adapted his ends to the limitations of matter in those natural forms. Thus, petroleum as he found it was not the ideal fuel for the internal combustion engine; it was only the most abundant and the most available, and he adapted his engine to it.

Now, however, he acts upon the inwardness of matter, to change the form of it as he likes, so that, instead of adapting his ends to the means, he may adapt the means to his fantastic ends. He finds that matter in any one of its natural forms is what it is because its molecules have a certain internal atomic structure. That fact is no longer final. He can alter the fact.

He has never seen that internal structure of the molecule. Nevertheless, he can draw a picture of it. Then he makes the astonishing discovery that he can change the picture. That is to say, he can redesign the molecule. He can break it down and build it up again to another design; and as he does this to the molecule, the form of matter he wants is bound to appear.

Is it rubber he wants? Suppose there is not enough of it in the natural form or he has been cut off from the source of it. But he knows that rubber is rubber only because its molecules have a certain internal design. All around him is other matter full of molecules that can be redesigned; and when to the molecules of this other matter he has imparted the rubber design, lo! there is the rubber itself.

Is it energy he wants—energy in liquid form that can be carried about in tanks, like petroleum? He may have no petroleum of his own or, again, not enough of it. He notes that sunshine still falls upon the earth as it did when solar energy was being stored in coal and oil. From there he goes to find that there is an annual catch and store of it in plant life. When he has made al-

cohol from the plant, he has solar energy again in liquid form. Thus he can reap it in the fields instead of digging it from the ground.

There is more. Hitherto, when man for his ingenious ends has wanted a material that was very hard or one that was very tough, he has had to find the hardest or toughest substance that occurred in the natural form and make it do; but now he says only that he wants something this is so hard or something that is so tough, and that it must be able to resist heat and cold to certain degrees, and the chemist undertakes to produce it artificially. When he has produced it he gives it a name, and it is a name strange to nature. Again he has redesigned the molecule, and this time to a pattern nature never thought of.

And now do we know what we mean when we speak of raw materials? Do we mean matter in certain natural forms, as nature made them and where she accidentally put them? Or do we mean just matter, which is everywhere?

Man acting upon his environment to alter it and man acting upon matter to change its forms are as of two different species. Given now the carbohydrates, vegetable oils, the alcohols, sunshine, air, land, and water, it is possible for him to shape matter in whatever form he likes—or nearly so.

What vistas are these, to be widened and lengthened by the necessities of a war which, in so far as it represents a struggle for the sources of natural raw materials and for markets, may be already obsolete in time and meaning! If this time the human enigma does not blow himself off the earth, he may come to a future such as he has not dared to dream of, and, for all his folly, a future of his own making.

—Garet Garrett

★ IN 1933 PRESIDENT ROOSEVELT commissioned George Peek, the nation's leading foreign trade expert, to prepare a report of America's foreign trade between the years 1896 and 1934, a period of 38 years. With the $50,000 furnished Mr. Peek he began his survey and one year later submitted it to Roosevelt. No one ever heard anything about it as Peek concluded his report with this statement: 'Our foreign trade for the 38 years between 1896 and 1934 did not bring us a profit, but brought us instead a loss of $22 billion.' —California Mining Journal

TECHNOCRACY

WHAT?

Technocracy is science in the social field. **Encyclopedia Americana** says: 'Whatever the future of Technocracy, one must fairly say that it is the only program of social and economic reconstruction which is in complete intellectual and technical accord with the age in which we live.'

WHEN?

Technocracy originated in the winter of 1918-1919 when Howard Scott formed a group of scientists, engineers, and economists that became known in 1920 as the Technical Alliance—a research organization. Some of the better known names in the Technical Alliance are of interest, such as: Frederick L. Ackerman, architect; L. K. Comstock, electrical engineer; Stuart Chase, C.P.A. (now well-known writer); Bassett Jones, electrical engineer; Leland Olds, statistician (now Federal Power Commissioner); Benton Mackaye (now in the Forestry Department); Charles P. Steinmetz and Thorstein Veblen (both now dead). Howard Scott was Chief Engineer. In 1930 the group was first known as Technocracy. In 1933 it was incorporated under the laws of the state of New York as a non-profit, non-political, non-sectarian membership organization. In 1934 Howard Scott, Director-in-Chief, made his first Continental lecture tour which laid the foundations of the present Continental membership organization. Since 1934 Technocracy has grown steadily without any spectacular spurts, revivals, collapses, or rebirths. This is in spite of the fact that the press has generally 'held the lid' on Technocracy, until early in 1942 when it made the tremendous 'discovery' that Technocracy had been reborn suddenly, full-fledged with all its members, headquarters, etc., in full swing!

WHY?

Technocracy's survey of the economic situation in North America leads to the conclusion that there is in development a process of progressive social instability, that this process will continue until the instability reaches the limits of social tolerance and that there then will have to be installed on this Continent a social mechanism competent to meet the needs of its people. Technocracy finds further that the day when social operations on this Continent can be based on a method of valuation has passed, and that it is now necessary that there be applied in the social field the quantitative methods of physical science. Technocracy, therefore, proposes that the North American Continent be operated as a self-contained functional unit under technological control. This control would operate the area under a balanced-load system of production and distribution, whereunder there would be distributed purchasing power commensurate with the resources and the continuous full-load operation of the physical equipment, with the guarantee of a high standard of living, equality of income, and economic security, at a minimum of working hours, to every adult inhabitant.

HOW?

At this stage the objectives of Technocracy are first, the education of the people of North America to a realization of the conditions behind the social crisis, and second, the organization of all those willing to investigate and interest themselves into an informed, disciplined, and functionally capable body whose knowledge and ability can be called upon to prevent chaos in North America at that time, now imminent, when the Price System can no longer be made to operate.

Technology's Decree

TECHNOLOGY is the social mechanics of the Power Age. The aspirations of human society of the North American Continent must be but the projection of the technological pattern of this Continent. The wish-fulfillment of the masses, the sincerity of the reformer, the enterprise of the politician, the vision of our intellectuals, the pathology of our economists, are but gestures of futility, straws in the wind, in the face of the march of power.

The soldier and the seer, the politician and the priest, the business man and the banker have ruled human society in every age until now. Technology in its march of power is serving notice on all of these, chiseler and sucker alike, that their day is passing, that a new order is clamoring at the gates. As technology moves up more power the gates will go down and a new leadership of men and things will be given to the world. This leadership will spring from those of the trained personnel of this Continent who have the courage, capacity, and discipline to administer and direct the technological application of physical science to the conduct of human affairs on this Continental area.

Today it is a notification. Tomorrow it is a command. —HOWARD SCOTT

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TECHNOCRACY DIGEST

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Science and Society

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Strip Mining in Alberta

Sugar Beet Mechanization

1946

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THE ONLY MAGAZINE IN CANADA THAT IS PREPARING THE PEOPLE OF THIS COUNTRY FOR SOCIAL CHANGE

JANUARY, 1946 VANCOUVER, B. C. No. 91

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Science and Society

Technology by its march of power is notifying every scientist, technologist and engineer, every capable man and woman, that they are automatically members of the general staff of the New America. You are the leaders of a new civilization. —Howard Scott

THE lag between mankind's technological-scientific and social-scientific development has never been greater than it is today. The harnessing of atomic energy has radically changed our technological expectations. But our failure to control the forces of nature for social good is as glaring as ever. This lag is symbolized by the fact that atomic energy was first unleashed for the destructive purposes of war. But if the horrifying effect of the atomic bomb has demonstrated anything, it is that we must close the gap between scientific achievement and social backwardness' (Heinz Eulau in **New Republic).**

The atomic bomb has blasted home a social lesson that Technocracy has been teaching the people of North America for the past thirteen years. The release of atomic energy has at last opened the eyes of press and public to the fact which has been reiterated so often by Technocracy, namely, that our social customs and folkways handed down from ages of low-energy agrarian civilizations are incompetent to operate or control North America's present high-powered technological civilization.

In December 1938 Howard Scott told the citizens of this Continent in an article entitled **Science and Society:**

'Science and technology have gone so far that the present social structure of the North American Continent is facing its debacle, its elimination . . . The scientists, technologists and engineers of this Continent are the general staff of the Technate of America, whether they like it or not. By their works ye shall know them, and the technicians of all branches have produced the works that are bringing about the demise of the Price System. Technocracy directly asks every scientist, technologist and engineer: Which are you going to serve, science or mammon, abundance or scarcity, Technocracy or chaos?'

Today, there is evidence that the

scientists, technologists and engineers are at last becoming aware of their significance in society. A large group of the foremost scientists in the United States, including Albert Einstein, recently signed a resolution urging the insurance of 'scientific freedom and the peacetime utilization of atomic energy in the interests of the whole people.' Among the signers were representatives of seven groups affiliated with the Federation of Atomic Scientists which professes to include 90% of the scientists who worked on the atomic bomb project. There were also 88 individual scientists from nearly all the major U.S. educational institutions.

The scientists themselves are beginning to see that we must close the gap between science and society. Dr. P. S. Henshaw, a leading member of the Association of Oak Ridge Scientists (an organization composed of more than 90% of the civilian scientists who did research on the atomic bomb at Clinton Laboratories), summed up the scientist's viewpoint: 'For many years an accusing finger has been pointed at the scientist for his concern solely with the work in his laboratory. To some extent such accusation was correct. We were not, in large, concerned with the social implications of our work. But now we can no longer remain unconcerned. The necessity to speak out has been forced upon us by the nature of the weapon which we ourselves helped to make. Man's very existence is threatened unless intelligent use is made of our discoveries.'

The relentless pressure of physical events is forcing the citizens of this Continent closer and closer to the social design that was drawn up in the **Technocracy Study Course** a decade ago. That design is not a philosophical dream of an ideal state; it is the blueprint of the social mechanism that can operate efficiently in the Power Age. It was written, not in the stars, but in the 'trends toward tomorrow.'

The technological history of the past decade has made more significant and insistent Howard Scott's social challenge in **Technocracy** magazine ten years ago:

'Technology is the social mechanics of the Power Age. The aspirations of human society on the North American Continent must be but the projection of the technological pattern of this Continent. The wish-fulfillment of the mass-

es, the sincerity of the reformer, the enterprise of the politician, the vision of our intellectuals, the pathology of our economists, are but gestures of futility, straws in the wind, in the face of the march of power. The soldier and the seer, the politician and the priest, the business man and the banker have ruled human society in every age until now. Technology in its march of power is serving notice on all of these, chiseler and sucker alike, that their day is passing, that a new order is clamoring at the gates. As technology moves up more power, the gates will go down and a new leadership of men and things will be given to the world. This leadership will spring from those of the trained personnel of this continent who have the courage, capacity and discipline to administer and direct the technological application of physical science to the conduct of human affairs on this Continental area.

'Technocracy is the technological orchestration of the infinite variables of human capacity and the equipment, structures and natural resources of the Continent in the social operation of North America for the production and distribution of a balanced-load abundance for all, with a minimum of human effort.

'Technology by its march of power is notifying every scientist, technologist and engineer, every capable man and woman, that they are automatically members of the general staff of the New America. You are the leaders of a new civilization. Today it is a notification, tomorrow it is a command.

'Technocracy salutes the march of power and your imminent leadership!' **—The Editor**

★ WE HOLD IN TRUST a power that is capable of unraveling the very fabric of our civilization. Equally, it may be susceptible of development as a mighty force for human welfare. But we have proved the destructive use, while the constructive applications are still in the realm of speculation.

Clearly the trust is of a magnitude that transcends national jurisdiction. No walls have ever been built high enough to fence in the spread of scientific knowledge, and even if we were resolved to forego the harnessing of atomic power for peace, it is hopeless to think that its application for war can be held for long as the monopoly of one, or a small group of nations.

At one giant stride our scientific and technological development has so far outdistanced our social engineering, that we have no choice but to turn our full powers of creative imagination to control the forces we have unleashed and to bend them to man's use rather than to his destruction.

—James H. McGraw in *Engineering News-record*

Canada and Cartels

Canadians who wonder why their electric bulbs have such a short life, why some radio tubes cost nearly three times as much here as in United States, may find an answer in the report CANADA AND INTERNATIONAL CARTELS.

SINCE the beginning of World War II, Canadians have been reading about cartel investigations in the United States. But the tabling of the report **Canada and International Cartels** in the House of Commons on November 8, 1945, was the first opportunity the Canadian public had of learning much about the operations and ramifications of monopoly control in this country.

The 60-page, 30,000-word document was prepared by F. A. McGregor, Commissioner of the Combines Act, assisted by nine economists and legal experts drawn from government service and universities. As part of their information gathering program they circulated questionnaires among more than 200 Canadian firms, either members of cartels or doing business with cartels. The report, compiled after a year and a half of research, shows the effect of cartel agreements on various products needed and exported by Canada.

In its official summary the report states that 'in the two decades between World War I and II restrictive trade agreements of private interests flourished and spread and that in so doing they (a) limited production and impeded the most efficient use of world resources, (b) raised or maintained certain consumer prices, (c) restricted the import and export of certain commodities, (d) restricted the use to which certain commodities might be put, (e) nullified external trade policies in certain respects, (f) resisted technological advances in certain fields, (g) created patent pools or monopolies covering wide fields of endeavor, (h) assisted the formation of private industrial empires which tended to supplant governments in the determination of certain national commercial policies.'

The report substantiates these charges by citing concrete examples of cartel control of the following commodities:

Electric Lamps—The report states that production of electric lamps in Canada and United States is largely controlled by the General Electric Co., a U. S. Corporation, which 'directly or through its subsidiary, International General Electric, has agreements with the principal foreign producers (England, Belgium, France, Holland, Germany, Japan, etc.) which provides for cost licensing of patent, exchange of information and allocation of territory.' It is pointed out that these agreements 'exclude the foreign producers from the Canadian market, which is reserved for those manufacturers in Canada licensed under Canadian patents, who are likewise barred from exporting to other markets.'

Such factors as the length of life, specifications of lamp construction, the report says, appear 'to have been drawn up in the interest of the manufacturers.' Long-life bulbs which have been produced in other countries, in Holland for example, 'are not permitted to be marketed in Canada.' Specific instances from American investigations indicate supposedly deliberate reductions in the life of flashlight lamps. Similar allegations are made regarding the delay in the introduction of fluorescent lighting (it was hindered from entering Canada until the monopoly was partly broken by an American company now facing infringement suits).

Radio Sets and Tubes—References are made to the agreement of 1925 whereby Radio Group (RCA — International — General Electric—Westinghouse) received Canada as part of its exclusive territory. Canadian patents on radio sets were subsequently pooled in Radio Patents Ltd., while those on radio tubes were placed in Thermionics Ltd.

Reference is also made to the investigation of the radio industry by the Tariff Board in 1939 and 1940, which 'found that Canadian consumers were being unduly exploited through arrangements then in effect.' The report adds: 'Until 1939, Canadian consumers were deprived of low-priced radio sets of a type which had been available in U. S. for a considerable period.' Uniform prices for tubes are fixed by license greatly above the level at which similar tubes are sold in U. S.

Tungsten Carbide—Cemented tungsten carbide for machine tools can be imported only from General Electric and its subsidiary, Car-

boloy Company, Inc., which had obtained virtual monopoly control under an agreement with German Krupp in 1928. Following the agreement the price was raised from $50 ('which was previously considered high') to $453 a pound, falling to $205 in 1936 and 'remaining at that still exorbitant level' until General Electric was indicted under U.S. anti-trust laws. Then prices dropped sharply to $55 a pound and later to $32.

Sulphur—The report states that elimination of competition in world markets and control possessed by two principal American producers permitted price of sulphur in the U.S. to be maintained, regardless of business conditions, at . . . fixed level of $18 per ton for 17 years prior to 1938.' The price was then lowered to $16 per ton, which became the new fixed level.

'In view of the stability of sulphur prices, it is interesting to note the trend of sulphuric acid prices in Canada. After remaining firm at $12 per ton for several years, the wholesale price advanced three times in the summer of 1929 to become stabilized at $16 per ton. This price was held all through the depression years and on into 1937 when it increased to $17 per ton. This suggests an aspect of price policy which should warrant closer examination. That is, that in the absence of competition, prices may move upward rapidly, but may be resistant to any downward movement.'

The two principal North American producers showed average profits of 13% and 29%, respectively, over a period of 20 years.

Chemicals—The report outlines relationships of Imperial Chemical Industries Ltd., of Great Britain, and the du Pont organization in U.S., stating that these companies (or their predecessors) laid back in 1910 the basis for a jointly owned company (Canadian Industries Limited) in which they now have a joint common stock equity in excess of 80%. Most important of the formal and informal arrangements made between these companies is stated to be the 'Tri-Party Agreement' of December 1, 1936. Under its terms, according to exhibits filed with U.S. Congressional Committee, the general effect is as follows:

1. C.I.L. is given exclusive rights in Canada to any processes owned by either of the major parties. 'However, the exercise of such rights with respect to the development of manufacturing

capacity in Canada is to be governed by the position of the major stockholders. The considerations to be applied are indicated in the following extract from the minutes of the Tri-Partite meeting held in Montreal in 1930. "It is very undesirable that C.I.L. should provide manufacturing capacity in Canada, if, from the family viewpoint, Canadian requirements can be more profitably supplied by the existing capacity owned by one of the major stockholders." '

2. C.I.L. is made sole distributor for any product shipped to Canada by either I.C.I. or du Pont.

3. C.I.L. is to confine its operations to Canada, and is not to engage in any export trade, even when 'it is in a favorable position to do so through tariff preferences or other causes.'

It is pointed out that because of restrictions on its operations, C.I.L. was unable to co-operate in efforts made by the Canadian Government to expand trade with the West Indies through the subsidization of steamship facilities from Canada.

Dyestuffs—'Imperial Chemical Industries entered the European Dye Cartel in 1931 under an agreement which reserved to itself the sale of dyestuffs in Great Britain. Two years previously, I.C.I. and du Pont had reached an agreement covering the exchange of patents and "know how" in a wide range of products, including dyestuffs. Du Pont agreed not to export dyestuffs to the British Empire, excluding Canada and Newfoundland, while I.C.I. agreed not to export to North and Central America, exclusive of British territory. In other markets, including British North American, the two companies undertook to eliminate competition between themselves and to co-operate in the sale of dyestuffs. Canadian Industries Limited was to be used as their agent in the sale of dyestuffs in Canada.'

Extracts from a letter dated October 26, 1939, are quoted to show 'how closely' various companies worked together to maintain prices. The letter refers to Canadian prices on a number of items. The report says there has been no Canadian production of dyestuffs in commercial quantities, and the market was supplied through Canadian representatives or foreign firms. In 1925, Consolidated Dyestuffs Corporation was set up in Canada as a wholly-owned subsidiary of one of the

German companies which became incorporated in I.G. Farben.

'Consolidated Dyestuff Corporation secured agency contracts for the sale in Canada of German and French dyes. After formation of the European Dye Cartel in 1929, French members appear to have been allotted a definite quota of the Canadian market. Consolidated Dyestuff Corporation was requested to observe a definite ratio between its sales of the products from I.G. Farben and French firms for whom it acted as exclusive Canadian agents. French firms were pressing for larger share of Canadian market and succeeded in 1938 in having proportion changed from 97% for German and 3% for France, to 94% and 6% respectively. C.D.C. was given close directions as to the product to be purchased from each of its principals and as to its purchase prices.'

Flat Glass — Canadian pre-war imports of window glass normally exceeded forty million square feet annually plus two to four million square feet of plate glass. The report traces arrangements between Belgian, American and British interests, dating back to an international plate cartel in 1904. It states that in 1934 American manufacturers entered arrangement with Pilkington and the International Convention of Plate Glass Manufacturers 'to observe cartel-established prices and regulate sales of plate glass in a group of export markets which included Canada.' This agreement was replaced by 'formation of the Plate Glass Export Association by American Companies.' On December 31, 1935, the American Companies and the Association 'made a declaration of policy with Pilkington and the Convention in which they agreed to divide the world market and fixed prices for plate glass. This agreement is alleged to have remained in effect until the outbreak of World War II.'

Free entry for plate glass items under the British preferential tariff of 1932 'did not fit in with division of the Canadian market as fixed by cartel arrangements among plate glass manufacturers of Great Britain, Continental Europe and the United States.' In 1936, at a Tariff Board inquiry 'Canadian automobile manufacturers complained of their inability to secure sufficient English plate glass to meet the requirement of empire content in export to other parts of the Common-

wealth.' (Canada needed British plate glass to fulfill 'empire content' clauses of the British preferential tariffs, but, despite the fact that in 1932 British plate glass was put on the free list, auto manufacturers could not obtain more than 22% of their requirements from England, having run athwart the plate glass manufacturers' private agreement.)

The report concludes that 'it is evident from the foregoing that the arrangements made by the cartel members prevailed in spite of the tariff change, and rendered the action of the Canadian parliament of no practical effect in relation to the trade in plate glass.'

Aluminum — The report states that the latest cartel—Alliance Aluminum Co. of Basle—was set up under an agreement in 1931 and renewed in 1936, and that 'the present Canadian producer, Aluminum Ltd., or its predecessors, entered into each cartel.' Aluminum Ltd. was formed in 1928 and received from Aluminum Co. of America practically all its foreign properties in return for common stock, which was then distributed to shareholders of Alcoa. Aluminum Ltd. became a cartel member with a production quota of 28.58%, compared with 21.36% for the French producer, 15.42% for the Swiss, 19.46% for the German and 15% for the British. Control of world trade was sought by fixing an alliance buying price, by regulating the production quotas of its members and by holding surplus stocks off the market.

Nickel — International Nickel Co. is described as 'a private, international organization' supplying from 80% to 90% of the world's nickel demand in the period between the two world wars. It is stated that I.N. has 'maintained a policy of a fixed price for nickel in American funds and its sales and distribution policies appear to have been accepted by the few other minor nickel producers.'

Falconbridge Nickel 'appears to have sold its nickel outside the arrangements by I.N., and principally to customers in Europe.' The smaller company 'could rely, however, on the price maintenance policy of the dominant company, which has held the price of nickel in the U.S. at 35 cents per pound since 1926.' It is also pointed out that I.N. has maintained a somewhat higher price for sales in Europe, and as Falconbridge disposed of practically all its produc-

tion in the European market, it secured the advantage of this trade differential.

Lead—The report traces various price and sales agreements which in 1921 included producers in Mexico, Australia, Canada, Germany and France. In 1929, Lead Sales Pool was established by producers in Australia, Mexico, Burma and Canada for the purpose of 'sharing lead sales in Europe and the Far East.' Its membership is said to have controlled between 30% and 40% of world production and an even larger proportion of world exports. It was later abandoned, but in 1938 the same group, along with Argentine and Yugoslavia 'reached agreement to form the Lead Producers' Association.' This body agreed to reduce lead production by 10% and withhold from sale any stocks of lead in excess of 150,000 tons. The purpose was 'to fix a floor below which the price of lead would not fall.' Although the agreement was in effect for a relatively short period, the report finds that 'restriction of production in 1938 appears to have prevented any substantial breach of the floor price agreed upon.'

Zinc—The report finds that the European Zinc Cartel in 1928 agreed to restrict production if London zinc prices fell below £24 a ton and in January 1929 arranged for 'closer co-operation among European producers, restriction of Canadian and American exports, and limitation of production if price fell below £27.'

This cartel dissolved and in July 1931 the International Cartel of Zinc Producers was formed, embracing producers in Belgium, France, Holland, Poland, Germany, England, Australia, Mexico and Canada. Agreement for control of production was reached and production reduced by varying percentages from time to time. Quotas were based on the highest quarterly output of each member from 1927 to 1930, with special allowances for certain new plants. A restriction of 40% to 45% of capacity was put into effect, later raised to 50% and then to 55%. Quotas were adjusted in 1933 to prevent a break-up of the cartel, 'but imposition of a 10% duty on non-Empire zinc by U.K., and establishment of a premium on production of domestic zinc by Germany created difficulties which could not be surmounted.'

This world cartel was not revived, but early in 1939 a special arrangement was made between

Empire zinc producers and smelting interests in U.K., as part of an agreement to maintain the smelting industry in U.K. Producers in Australia, Rhodesia and Canada 'then entered into agreement with Imperial Smelting Corp. of England, for payment by the producers to the corporation of a subvention on the tonnage of zinc sold in U.K. The producers also agreed to pay rebates to exporters of zinc from U.K. based on the amount of zinc contained in exports of any goods in which the cost of zinc was an important consideration. It provided that the production of zinc metal by Imperial Smelting Corp. should not exceed 60,000 long tons per year. However, the producers agreed that Imperial Smelting Corp. might produce up to 117,000 long tons per year during the war under certain conditions.'

Copper—The report refers to early efforts after World War I to pool stocks of copper. It finds that a company called American Metal, Canada, 'stated to be an affiliate of International Nickel Co.,' was listed from 1930 to 1932 as a member of Copper Exporter, Inc., described as a 'cartel international in scope, comprising nearly all important producers and dealers in the world.'

After the U.S. copper duty of May 1932 cut off the American market from the rest of the world, it was not until 1935 that producers, 'representing about 75% of world production, exclusive of United States, Russia and Japan, succeeded in re-establishing the cartel.' Canadian producers 'did not become official members of this Chilean-African Copper Cartel, but it was understood that they were in sympathy with the program of production control and price improvements which the cartel was attempting and would follow a parallel course in marketing copper so as not to upset the arrangement.'

Control of exports of refined copper from Canada concentrated in two subsidiary companies. American Metal Co. of Canada Ltd., subsidiary of American Metal Co., with offices in New York, acts as sales agent for the entire copper production of International Nickel, while the British Metal Corp., (Canada) Ltd., acts in a similar capacity with respect to production of the only other Canadian refinery. 'The fact that imports of refined copper into Canada have been subject to a tariff duty has enabled these

companies to charge Canadian users of copper a higher price than that secured from the sale of refined copper on world markets.' It is also stated that in 1935 arrangements were made providing that 'Canadian producers would restrict their direct sales to Canada while the British manufacturers would confine their sales to the United Kingdom and certain other parts of the Commonwealth.' Each group appointed the members of the other as agents for any sales made in the other's territory.

Radium — 'At each period of radium production, monopoly control has been dominant. In the first stage American producers kept the price at $100,000 or more per gram, although cost of production was reported as about $70,000. Then the Belgian company (Union Miniere de Haut Katanga) held the price at about $70,000 per gram, a price which would keep American producers out but apparently much higher than its actual cost of production. Finally development of high grade ores in Canada led to active competition and a reduction of price by 1938 to less than $25,000 per gram.'

Potash — Arrangements were allegedly made in 1926 between German syndicate and French producers to share world markets, basis 70% Germany, 30% France, with uniform prices. From 1924 to 1933 prices at North American ports remained practically unchanged. Polish producers were given 4% of the world market in 1932.

In 1934 Russian, Spanish, and American production was increasing, and price cuts of 50% were made in North America. New competition was soon apparently 'looked after' and prices at U.S. ports gradually increased, and kept constant during 1937, 1938 and 1939.

The report says that 'as there are no potash deposits being worked on a substantial scale in Canada, our agricultural needs ... had to be met by imports which were subject to the cartel arrangements. Branch of European Cartel Sales company established Montreal 1928. In 1932 this incorporated as Potash Co. of Canada Ltd., subsidiary of German-French cartel, headquarters then Holland. The close relationship between the cartel and the American distributors provided an opportunity for Canadian manufacturers and distributors of fertilizers to formulate

common policies as to prices and conditions of sale.' Resale of potash was deliberately kept at a high level to prevent farmers from mixing their own fertilizer.

Nitrogen — The report traces control of synthetic nitrogen to an international cartel, known as D.E.N. This group once embraced 80% of world production, but 'in 1938 some 35 synthetic nitrogen producers including D.E.N., entered into world-wide agreement, Convention Internationale de L'Azote (an international nitrogent cartel). Home market of each group reserved for national members; quotas established for export under arrangements providing for the averaging of receipts from sales made through joint selling agencies and for compensation to members selling less than their quotas by requiring purchases by members who exceeded the quotas fixed.'

In Canada, says the report, prewar use of fertilizer nitrogen from domestic sources was confined largely to sulphate of ammonia, by-product of steel and coke plants, and of Consolidated Mining and Smelting Co. as part of its manufacture of synthetic fertilizers at Trail, B.C. Calcium cyanamide, nitrogenous product, was manufactured at the Canadian plant of American Cyanamide Co., Niagara Falls, Ont., but practically the entire output was exported to U.S. Canadian pre-war production of sulphate of ammonia was in excess of the domestic demand. Logical export markets were agricultural areas on U. S. Pacific coast, the Hawaiian and Philippine Islands and other territories bordering the Pacific, but 'most of these markets were already subject to understandings between American producers and the nitrogen cartel.'

Division of markets was discussed by the Canadian producer with cartel members. In complaints of U.S. Department of Justice, it was alleged that 'quotas were allotted to Canadian company in certain markets, including U.S. and the Philippine Islands, and uniform prices on the basis of nitrogen content were agreed upon.'

Prior to 1938, synthetic nitrate of soda was imported direct from Norway. This permitted bulk steamer shipments and consequently lower cost to Maritime farmers. 'When agreement reached by cartel members for allocation of export markets, Canada allocated to U. S. and Chile. Further

shipments could not be made to Canada from Norway . . . Supplies were usually handled through the Port of Baltimore, which made it impossible to secure direct shipment. Control exercised by cartel thus deprived Maritime farmers of freight advantages which their location near tide water ports had made possible when fertilizer supplies could be purchased on competitive basis.'

Phosphorus—The report quotes U.S. Department of Justice investigation where 'it was revealed that agreements had been made with fertilizer companies in Canada for sale of superphosphates on condition that American firms would refrain from selling mixed fertilizer in Canada.' Reference is also made to enquiries before the Canadian Price Spreads Commission in 1934 regarding 'a close association which established uniform delivered prices for each grade of fertilizer, regardless of the actual freight cost from the mixing plant to the farm.' It is stated that co-operative organizations had forced some modification in policy of fertilizer manufacturers, 'but control over basic materials established by the International Cartel arrangements appears to have continued until the outbreak of war.'

Soda Ash—It is stated that the only manufacturer of soda ash in Canada is Brunner-Mond Canada Ltd., which 'apparently' is associated with Solvay Process Co., American subsidiary of Allied and Chemical Dye Corp. Two substantial users of soda ash said that in the pre-war period attempts had been made to secure quotations from producers outside Canada, but that in each case it was 'impossible to find any alternate source of supply as the market appeared reserved for Brunner-Mond Canada Ltd.' While the latter company indicated 'that it had not entered into any international arrangements of a restricted character,' the report concludes that 'in view of the fact that the Canadian company is a subsidiary of an American corporation, the Canadian market might have been reserved for it by reason of arrangements made outside Canada by the parent company'.

Acetic Acid—This chemical is one of the most important in Canadian industry. It is the basic material of one form of artificial silk and is also used in the manufacture of solvents. It was first produced commercially through

wood distillation and in World War I was produced synthetically by a predecessor of Shawinigan Chemicals Ltd.

The report quotes evidence given to U.S. congressional committees to the effect that when exports by S.C.L. to U.S. were threatened by possible development of plants in that country, the Canadian corporation entered into an arrangement with the Union Carbide Co. and another American firm to establish a joint company, Niacet Chemical Corp. This jointly owned corporation then began production of acetic acid in the U. S., using processes developed by Shawinigan.

'In the meantime, Shawinigan Chemicals endeavored to protect its position further in European markets by entering into agreement with the Distillers' Co. and I.C.I. of England and the Essigsaeure-Gesellschaft, an I.G. Farben subsidiary, as part of the world Acetic Acid Cartel. In 1931 the production of acetic acid by Jasco (Joint American Study Co.), a joint Standard Oil-I.G. Farben chemical company in U.S., seemed likely to disturb Niacet's position as dominant producer of acetic acid. The danger was removed by an arrangement between Jasco and Niacet, whereby the latter became the sales agent for Jasco's production and later, at the instance of I.G. Farben, Jasco decided to abandon production of acetic acid in order to avoid possible conflict with du Pont and Union Carbide.'

Titanium Pigments—The report relates the part taken by National Lead Co. of U.S. 'in organizing a concert of titanium interests throughout the world, so as to establish what virtually amounted to a world combine.' In 1937, National Lead entered into 'an arrangement with Canadian Industries Ltd. for establishment of a jointly owned corporation, Canadian Titanium Pigments Ltd.' The new company granted exclusive royalty-free rights in Canada and Newfoundland covering manufacture and sale of titanium pigments on condition that it 'agreed not to export titanium pigments manufactured in the proposed Canadian plant.'

It is further stated that Quebec province has small deposits containing titanium oxide, and that the oil had been shipped to the United States for further processing; that sometime prior to 1928, the Bureau of Mines developed independently a process for extract-

ing this oxide, and a Canadian company was formed to exploit the process and application made to the Tariff Board for a protective tariff. It was alleged at the hearing that the production of oxide was subject to a world cartel and the company did not undertake production in Canada. Thus, so far, Canadian deposits have not been used for the production of titanium oxide.

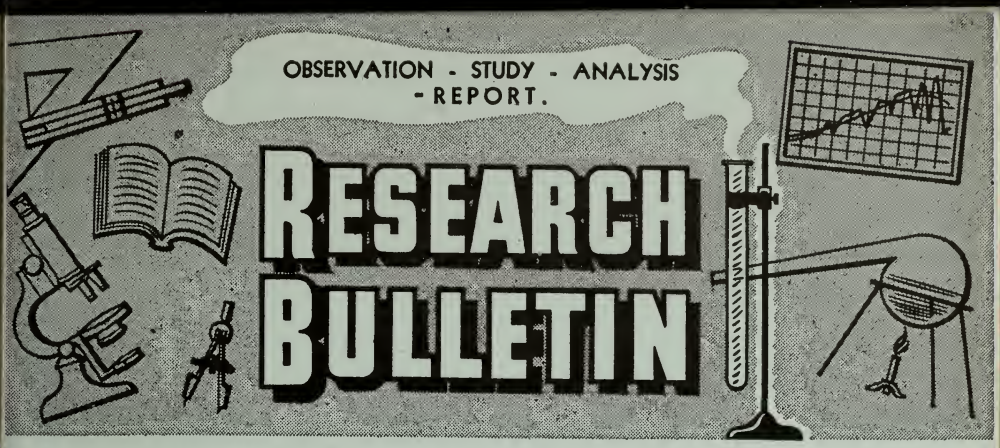
Matches—The report states that the Canadian match industry is 'almost completely subject to the world-wide control exercised by the three dominant concerns (Diamond Match Co. of the U.S., Bryant & May of Great Britain, and the Swedish Match Co.).

It is claimed that monopoly control in Canada was re-established in 1927 when the three leading Canadian match businesses were amalgamated into a new corporation, the Eddy Match Co., in which Bryant & May acquired almost 60% of the stock and Diamond 45%.

'No formal agreement was necessary to secure the adherence of the Eddy Match Co. to cartel arrangements as the controlling interest in Bryant & May was sufficient to achieve this result. The policy was decided by the cartel members outside Canada that Canadian production should be sold only in Canada, while they would refrain from exporting matches to Canada.' It is pointed out that from time to time, independent match companies sprang up in Canada, but that few survived for long or maintained their independence. In 1936, 'the Eddy Company acquired control of the Canada Match Co., which was operating a match factory in Hull, and in 1940, Federal Match Ltd., also of Hull, was brought under Eddy control.'

The report also notes that chlorate of potash, most important chemical used in match manufacturing, was imported from Germany and distributed through Diamond Match subsidiary, Uniform Chemical Co. 'not only to match companies in the United States, but also apparently in Canada.' When war broke out, cutting off supplies from Europe, Uniform Chemical entered into contract with Electric Reduction Co. of Canada, Ltd., 'which had previously tried unsuccessfully to find a market for chlorate of potash, to supply 500 tons per year, which Uniform allocates among Canadian match factories.' It is

(Continued on page thirty-five)



JANUARY, 1946 Compiled By Editorial Staff No. 36

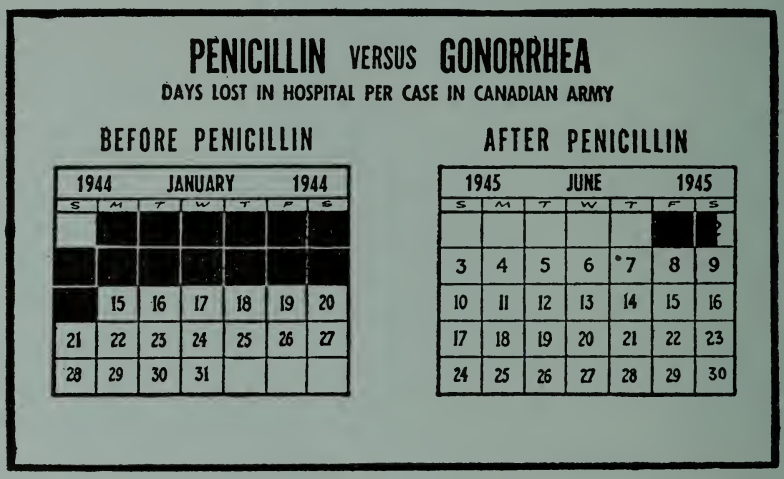
Science in the Peace

THE fury of atomic energy has at last been released. But the devastating impact of the atomic bomb has resulted in more than the physical destruction of Japanese cities. Many people, including even some of the bomb's originators themselves, have been stunned at the power that has been let loose and are fearful of what it may mean to civilization. The Sunday supplements have already hinted at the possibility of universal suicide. Throughout the United Nations, people are thankful that the solution of atomic secrets fell first to us and not to our enemies.

For decades the study of atomic energy and radio-active materials progressed leisurely, hastened first in one country then in another with bits of fresh knowledge—scarcely ever seeming to touch on the life of the man in the street. What, then, enabled this branch of science— nucleur physics—to take such a big leap forward during the latter years of the war to the point where cool learned theory exploded into blistering reality over the cities of Japan?

Before answering this question, let us take some other examples of scientific research and development that are more familiar to us because less shrouded in secrecy.

Every Canadian remembers the date 1929 as the end of the plenties of the 20's and the beginning of the plunge into depression. In that year a few scientists in Britain—notably Alexander Fleming— separated from a blue-green mould the golden grains which have come to be known as penicillin. As everyone knows by now, penicillin is the only agent we have to combat certain virulent infections. The startling properties of this new drug were observed in 1929, or even earlier, yet mass-production of it was not begun until 1943.


PENICILLIN VERSUS GONORRHEA
DAYS LOST IN HOSPITAL PER CASE IN CANADIAN ARMY
BEFORE PENICILLIN
1944 JANUARY 1944
S M T W T F S
15 16 17 18 19 20
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AFTER PENICILLIN
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Every Canadian also remembers the date 1939 as the end of formal peace and the beginning of war. In that year a few scientists in Switzerland recognized the possibilities of DDT as an insecticide. Here too the results are startling; DDT not only kills insects and pests of all sorts with great efficiency, but it is a synthetic material and this means that its supply is virtually unlimited. Up till now the most efficient insecticides were available only in small quantities because they had to be extracted from comparatively rare flowers and roots; but DDT is made in a pot in much the same way as, for instance, shoe polish is produced. This means that for the first time in history we are able to launch a full-scale attack on those two scourges of mankind: typhus and malaria.

Mass production of both penicillin and DDT was begun in 1943.

Both achieve supremely desirable results for human beings. Why then was DDT made available within five years of its recognition as an insecticide whereas penicillin production was not begun until fifteen years after its discovery?

Was it because the Swiss scientists were more alert than the British? No, since in each case large-scale development was done by other people in the United States. Was it because information on penicillin was withheld? No, since all experimental findings were published in scientific journals from the beginning. Nor does it explain anything to say that penicillin was developed because it was essential to the war, since it is clear that its desirability and significance would have been equally great in peacetime.

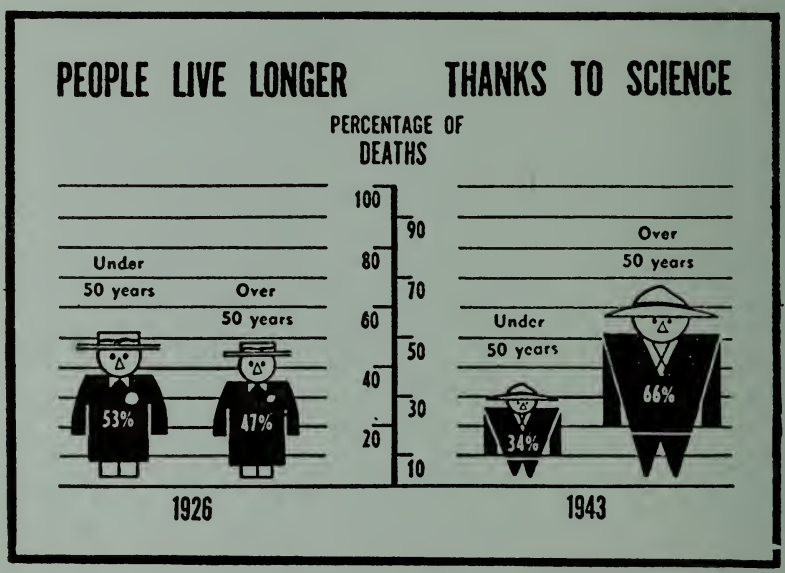
The real reason why DDT was brought to use in so much less time than was penicillin is that since 1939 scientists have been mobilized to meet their country's needs and their work has been co-ordinated to an extent never before known. This is even more true of the eleventh hour spurt in the development of atomic energy, where scientists were mobilized not only nationally, but on an unprecedented international scale.

In the emergency, the governments of all nations in the struggle mobilized their scientists, put the problems of the war before them and urged them to great new efforts in fields hitherto neglected or left entirely untouched. These scientists were given not just problems to solve: they were given facilities, money, equipment and time. They were given assurance that valid results would quickly be put to use. Under these conditions, the work of the scientists was co-ordinated and organized—just as the work of producing munitions and tanks and ships was organized.

Throughout the war period, whenever a particular scientific objective seemed to be worth achieving—whether some new material, new information or new technique—it was possible to create whole laboratories and put them to work. This meant, for example, that from the moment the wartime potentialities of atomic energy were first realized, it was possible to initiate work on the problems involved in its mass-production and application. On the other hand, although potentialities of penicillin were clearly recognized in 1929

or earlier, and the experiments were published and available to everyone, the necessary organizations did not then exist and the necessary funds did not **seem** to exist for pressing forward the development of this important discovery.

The record does not stop with the example mentioned. As a direct result of the scientific and technical war effort we have today more efficient engines for planes and cars and ships; better fuels and lubricants to service those engines; more precision instruments of all kinds, but especially in the field of radio communication and radio direction finding; improved metallurgical processes resulting in new and better metals and alloys; many more synthetic materials of all sorts, such as rubber and plastics; a wider application of products obtained from coal, wood, air and sea-water. This partial list represents what planned science has accomplished in the last few years.



These results were obtained by co-operation in a vast national, and to some extent international, enterprise involving on the one hand the industrial plants and on the other hand government agencies.

In Canada, the National Research Council set up committees

to co-ordinate scientific activity in every field relating to the war effort. The personnel of these committees consists of representatives of the government, private industry, the armed services and the universities.

Of course, there were many factors favouring the organization of these groups in wartime which had not existed in peacetime. The national emergency forced us to use our limited scientific resources, both human and natural, to the best possible advantage. It meant that we could retain our scientists in Canada and, through such agencies as the Wartime Bureau of Technical Personnel, place them in the positions where they could do most good. The important thing is that this was the first time these groups had met regularly to discuss scientific problems and make plans for their solution.

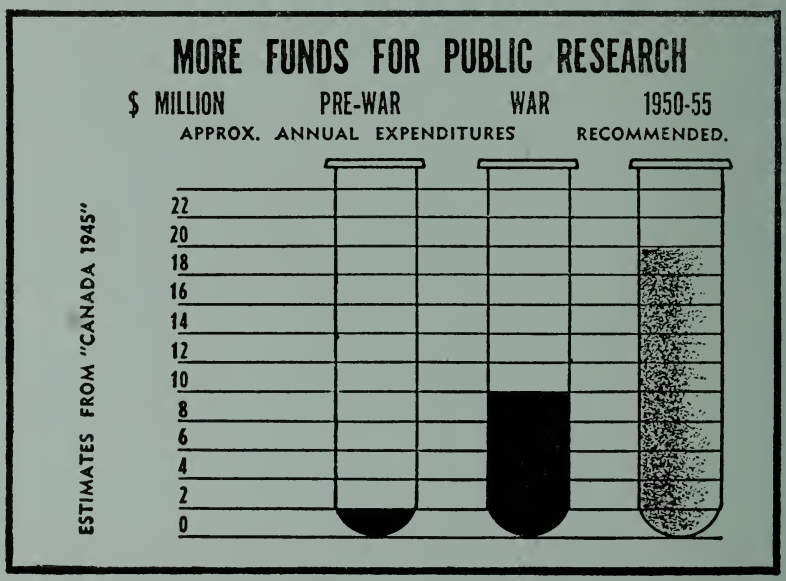
How did such groups function? First the scientists presented the results of their research and if the armed services were interested in some new material or process and thought it might be useful, then the manufacturer produced a small batch in a pilot plant. By this method a small amount was made available for trials by the services. At later meetings the services reported on the new material in the field or at sea or in the air. If they felt that it had been successful the manufacturer began large-scale production based upon the knowledge and experience gained in the pilot plant. By then the scientists would probably be suggesting some other improvement or innovation and so it went. The important point is that each group brought a different kind of knowledge to the solution of problems in the national interest.

In this way scientists have learned to work in large groups. At the beginning of the century it was possible for a rugged individualist like Edison to design and produce the electric light bulb in his own kitchen working with odds and ends of equipment. But scientific knowledge is piling up at such a greatly increased rate today that no one person can hope to keep pace. Just as the development of aerial warfare made individual dog-fights obsolete, so the lone-wolf investigator has been hopelessly outdated. No one person invented the atomic bomb, nor radar, nor the B-29 Superfort. All of these precision instruments for that is what they are, required for their successful

development the combined skill of thousands of scientific personnel working together, each group benefitting from the knowledge of the others.

At the moment in Canada we have the organizations and the funds required for planned science. We have mobilized for war and, incidentally, we have obtained results useful in peacetime as well. Surely then it now is to our advantage to do the same when **all** the results will be useful. The investment in terms of money is enormous but it yields handsome profits in terms of human welfare.

What is our position here in Canada on the postwar planning of science? Before the war we were woefully far behind. According to the figures tabled in the House of Commons by the Minister of Trade and Commerce we spent annually on scientific research, both public and private, only 29 cents per capita while Britain spent 80 cents, the U. S. A. $1.80 and the U. S. S. R. $2.40.



At present, however, the situation is much improved and Canada has emerged from the war with great scientific prestige. Dean C. J. MacKenzie, President of the National Research Council, recognizes this

and referred to research as a 'national necessity' in a speech delivered last Autumn. There is no doubt that we can maintain this prestige since we have ourselves created it. But **will** we maintain it? That depends on us; it depends only on whether the majority of Canadians want to.

The extent to which Canadians will benefit from science in the postwar world is largely influenced by social factors beyond the control of scientists as a group. Up till now only a fraction of the potential benefits of science have been realized; the war has shown that if we have the will to do it we can make and apply scientific discoveries with a speed and completeness unthinkable five years ago. What has been done during the war can be done equally well during the peace if enough of us agree that it must be done. This is where the scientist and the citizen can work together. The scientist knows what is physically possible and what is impossible; but only the citizen can furnish him with the tools to translate that knowledge into reality.

—Raymond Boyer in Canadian Affairs

EDITOR'S NOTE: *Raymond Boyer is National Chairman of the Canadian Association of Scientific Workers. The elimination of the Price System in North America and the installation of the Technate will enable our scientists to put their knowledge to its fullest use, without monetary restrictions.*

Strip Mining in Alberta

STRIP mines operated in Alberta for the Federal Government's Emergency Coal Production Board are helping materially to avert a serious shortage of coal during the winter months across Canada, particularly in Ontario.

They are also giving many strong arguments to those who have been agitating for the processing of coal from Alberta's vast reserves; and they are causing some concern amongst the long-established underground coal mining industry.

Opened up more than two years ago to produce speedily large tonnages of emergency fuel, government-sponsored strip mines in the

foothills province have been shipping their output to consumers scattered across the Dominion from eastern Ontario to the Pacific Coast and southward into the northwestern United States.

Much of the coal burned in the four western provinces during the past two winters came from strip mines in Alberta. This season, however, the bulk of their daily production of more than 4000 tons has been going to the Ontario market. Expectations are, though, that as the winter advances more and more of the strip-mined coal will be used to fill western requirements.

While six strip mines were started in Alberta by the Federal Government in its frantic search for emergency fuel in August of 1943. only four of them are now operating. The other two could be pressed into production on short notice.

As in past seasons, those in production are being operated for the Emergency Coal Production Board by contracting companies.

Largest of the mines is that operated at Eyremore, 50 miles northeast of Lethbridge, by the Birnwell Coal Company. Its daily production this season has been averaging about 1400 tons.

The other three government-sponsored strip mines in operation have a daily production of above 900 tons each and are operated by: Western Ventures on a site six miles north of Taber and 35 miles east of Lethbridge; by the Continental Coal Company at Grassy Lake, about 50 miles east of Lethbridge; and by Camrose Collieries Ltd., at Camrose, 30 miles southeast of Edmonton.

The two properties which are not in production are located two miles northwest of Taber and at Castor.

The former, known as the Majestic Mines property, was operated during July and August of the present season by Western Ventures and put out nearly 30,000 tons of coal. By the end of August, Western Ventures had mined most of the coal which had remained uncovered from the previous season and the company then transferred its activities to its own property, where 70,000 tons of coal are now being mined.

The property developed by the Winnipeg Supply & Fuel Company near Castor, about 100 miles southeast of Edmonton, is the only government-sponsored strip mine in Alberta which did not go

into operation this year.

Before the strip mines opened for their third season at the beginning of July, they had shipped in the neighborhood of 300,000 tons of coal to market. This season's operations are expected to boost that total by nearly 250,000 tons. The combined output for the first two seasons is comparatively small owing to the fact that production was restricted to about 75,000 tons during the first season by the need of extensive development work to uncover seams of coal.

Mines sponsored by the Federal Government are not the only strip mines in Alberta, official figures revealing that at this time no less than 38 strip mines are in operation in the foothills province.

Last year 45 strip mines operated and their combined production was officially reported at 766,372 tons, the total including the bulk of the output of the government strip mines during their first season of production and part of their second season's tonnage.

Generally speaking, the strip mines not sponsored by the Government are small producers, some of them operating with only a few men to supply local demands.

One large strip mine, however, was opened up by private interests during the past summer about four miles north of Blairmore in the Crow's Nest Pass and is expected to attain a daily production of from 500 to 900 tons of coal. The seam there is at least 30 feet thick and tests have proven it to consist of a high grade of steam coal. Unlike other strip mines in Alberta, which have a comparatively shallow over-burden of earth, gravel and in the odd case a foot or two of soft rock, the Blairmore seam is covered by a thick layer of earth and solid rock.

Producing coal by strip mining methods is not new to Alberta—naturally not in a province where coal is found near the surface in the scores of districts and can be easily won. Early settlers used ploughs and home-made scrapers to uncover coal and obtain their fuel as far back as 50 years ago.

However, little was done about developing the surface coal until a few years ago—when highly-efficient power machinery enabled man to push away earth and rock by the thousands of tons and easily expose acre after acre of coal to the jaws of power shovels.

Power machinery, such as was used on the Alaska Military Highway and on some large construction projects in the interior of British Columbia, was just beginning to crawl into Alberta when the menace of a critical coal shortage sent Federal authorities on a desperate search for fuel during the summer of 1943.

Promising sites were located in the plains area of Alberta and contracting companies were given the job of removing the overburden and then mining and delivering the coal to railway shipping centres. Fortunately, an abundance of coal was found close to the surface, and only a few miles from railways, and costs of production have been low—at times much too low to please operators of many underground mines and some officials of miners' unions.

The half dozen government-sponsored strip mines tapped millions of tons of coal and if they were to produce for the remainder of this century at their present rate there would still be more coal left in their districts than had been removed.

In every strip mining area there are thousands and thousands of acres of coal near the surface, much of it recoverable by strip mining. Officials explain, however, that a combination of strip mining and underground operations would be most economical for greatest recovery. They estimate that strip mining is economical up to the point of removing ten feet of overburden for every foot of coal seam.

Most of the government-sponsored mines have a coal seam three to five feet thick lying from 10 to 45 feet below the surface.

How large strip mines operate can best be described by dealing with specific property, so let's consider the case of the Western Ventures property north of Taber where powerful modern machinery is in action.

Western Ventures, a Winnipeg company, has the contract with the Emergency Coal Production Board to develop part of a large coal seam on the old Archie McLean ranch along the north bank of the Oldman River, and Charles Robinson is in charge of operations, supervising stripping, mining, hauling, shipping and marketing.

A sub-contract to strip, mine and haul the coal to a railway tipple is held by General Construction Company (Alberta) Limited, a subsidiary of the parent General Construction Company in Vancouver,

with W. E. Gemmill in charge. This firm has awarded Nilsson and Tollestrup of Lethbridge the loading and hauling contract.

Averaging more than 40 inches thick, the coal is found at an average depth of about 20 feet with the 'dips' being about 42 feet from the surface. But that's no worry to workers as they tackle the overburden with huge bull-dozers, scrapers and Le Tourneau carry-alls.

A strip about three-quarters of a mile long and about 200 feet wide is marked out alongside of workings where coal has been removed and the power machinery shifts the overburden aside into the old workings.

Crawling about like weird pre-historic monsters, the carry-alls move 12 and 14 yards of dirt on every trip, making a complete trip every five minutes. They move the dirt quickly, and cheaply, as they must to make operation of strip mines economical. On the Western Ventures property the contract this season calls for the removal of 400,000 yards of dirt and mining of 70,000 tons of coal.

In most cases the thin layer of rock on top of the coal seam can be ripped off in huge chunks, but often blasting is necessary to smash it.

Then, when an area of about 20 acres of coal has been exposed, comes the actual mining and the beauty of the entire operation.

A single gas-operated power shovel starts biting into the coal and what it does make you pay attention, especially when an experienced operator is at the controls.

On the Western Ventures property, Angus Meston of Windsor, Ont., shows his ten years of experience with power shovels as he operates one which weighs 43 tons and can lift 20 tons with ease. Each bucketful dumps a ton and a half of coal into a waiting truck.

The average time taken by Meston to tear his one-ton scoop through the coal seam, dump the load into a truck and return the bucket to the seam was 11 seconds for filling a truck with seven and a half tons of coal, as I watched him the other day. He idled along with another truck and averaged 12 seconds per dump, or one minute for the truckload. That one power shovel kept 15 trucks busy hauling coal to the tipple six miles away.

The speed at which coal can be mined once it is stripped is obvious.

In an eight-hour shift Meston loaded 887 tons of coal; in a nine-hour shift 940 tons.

There is another strong point which cannot be overlooked. Only 42 men were employed on the stripping, mining and hauling, compared with more than 200 men required in an underground domestic coal mine to produce the same tonnage.

Another 15 men were employed at the tipple to put the coal through screens in the completely electrified plant, load it into railway cars and treat it for shipment.

Because much of the coal is found near the surface and has not had waterproof protection down through the centuries, it is comparatively high in moisture content, that from the Western Ventures property testing about 16.2% moisture by weight as it comes from the mine.

Consequently, the coal has a tendency to shatter and about one-third of the production comes out of the tipple as stoker and nut coal. The over-all loss in dirt and slack has been working out to less than 8% with proper screens.

The high moisture content of the coal and the resulting shattering has been the greatest problem of government-sponsored strip mines in Alberta.

While they have been swamped with orders for lump and egg coal, they have generally experienced difficulty in finding markets for the small sizes, and thousands of tons of good stoker and nut coal went out to storage piles.

At the Western Ventures property the situation became so serious that lack of orders for small coal forced a halt in production for most of September. With more than 10,000 tons of small coal from this season's run in dumps covering acres of prairie land and the company flooded with orders for lump and egg coal, Mr. Robinson told me: 'We simply had to stop production because there is a limit as to how much coal we can dump out on the prairie.

'Even a government-sponsored mine cannot go on indefinitely dumping a third of its production into storage dumps where the coal will deteriorate. If we are going to operate we need orders for small coal as well as for the larger sizes.'

A demand for some of the small coal was found in Ontario during the end of September and the mine went back into production.

This menacing situation is not confined to the Western Ventures mine. It is general for all strip mines in the plains area and they have tens of thousands of tons of stoker and nut coal in lump piles. Hopes of operators are that a substantial market will be found for the small coal in British Columbia, eastern Canada and United States industries as the winter advances.

There is a difficulty here, too, however. Underground mines which are not operated under government sponsorship also produce large tonnages of small coal in their normal operations and they have objected strenuously against competition in their established and needed markets by government-produced coal. It is the small coal which often determines whether a colliery will experience success or failure.

Some of the strip mines managed to make heavy shipments of small coal to Spokane and Seattle last winter, being able to offer the fuel at a somewhat lower price than underground collieries. The shipments were quickly stopped, however, after large colliery operators employing thousands of miners, protested that the government strip mines were established to produce emergency fuel not to go into the competitive market with a type of coal which was in surplus supply with privately-operated underground collieries.

Sending strip mine coal on the long and rough trip to Ontario and the Pacific Coast presented a serious problem from the start but protection against the coal crumbling was secured during the first two seasons government-sponsored mines operated by spraying the top of the coal in railway dump cars with calcium chloride and then covering it with heavy building paper.

This season, however, the coal is sprayed with a light oil produced especially for that purpose and the treatment gives even better protection.

Considering the high moisture content of surface coal and its tendency to break, exceptionally few complaints have been received from consumers. On the other hand, shippers interpret the steady flow of repeat orders as proof that the coal is 'satisfactory.'

Government analyses have shown Alberta strip mine to test as high as 13,000 B.T.U.'s per pound.

The heat value of the Taber coal is 9,980 B.T.U.'s per pound as it comes from the mine; its ash content by weight is 9.4%, volatile matter 30.1% and fixed carbon 44.3%. With the moisture removed by a drying process, the composition of the coal becomes 11.2% ash, 36% volatile matter and 52.8% fixed carbon, and the coal has a heat value of 11,920 B.T.U.'s per pound.

Use of power machinery in government-operated strip mines has soundly proven the cheapness of this method of mining coal in Alberta when it is found near the surface and enables 100% recovery of the coal in the accessible seam. Combined with underground operations, strip mining is regarded as the answer to development of Alberta's vast coal resources.

People who have been agitating for the establishment of processing industries on the province's coal beds argue that modern machinery has opened the door of Alberta becoming a densely-populated and wealthy province by making full use of its coal. Research has proven that the coal can be processed to yield 126 by-products at least, including gas, oils, dyes, coke, perfumes, acids, aspirin, tar, pitch and lamp black.

There is said to be something like 61 billion tons of coal in Alberta, according to an authoritative estimate.

'Recovering the real and full value which Nature placed in this coal would give employment to hundreds of thousands of men and women and would turn Alberta coal fields into industrial empires,' claim many Albertans.

Operators of privately-owned collieries agree on the possibilities of Alberta's coal resources, but most of them are set against tolerating competition from strip mines operated by the federal government.

'Such mines are alright in a pinch to secure emergency fuel, but they have no place in normal times when underground mines employing large numbers of men have difficulty finding markets,' one colliery operator told me the other day. 'They can get the coal cheaply, but then it is not as high quality as deep seam coal and flooding

the market with surface coal should easily prejudice buyers against all Alberta coal.'

Miners' unions are not overly enthusiastic about the operation of strip mines either, and some of the officials would just as soon see them forgotten after the dangers of coal shortages pass.

For one thing, as strip mines can produce coal quickly and cheaply, they threaten the future of underground mines. The 766,372 tons of coal produced by strip mines last year is more than 10% of the 7,427,433 tons of coal put out by all mines in Alberta during 1944, and strip mines operated only a few months.

Some union officials fear that strip mines could be developed to the point of taking care of the entire western requirements and while they are not broadcasting it, they feel that strip mines could weaken the power of organized miners.

Some miners maintain that opening of the strip mines in Alberta by the government in the summer of 1943 was planned as a safeguard against the general miners' strike which was looming and then developed throughout Alberta and British Columbia towards the close of that year.

Another fact irks union officials. Methods employed in strip mining do not demand experienced coal miners—not of the underground school. Most of the employees of underground collieries have been organized into unions embraced by the United Mine Workers of America but the men stripping, loading and hauling coal for surface mines are not in unions.

This is receiving more than passing attention as talk drifts through underground mining camps that another general wage increase should be demanded by miners when their contracts with collieries expire within several weeks.

The operators of strip mines sponsored by the government are not engaging in any arguments with either underground colliery operators or workers, however. Their job is to produce emergency fuel to help prevent a coal shortage in Canada and, they say, 'that's what we're doing We start and stop and do what the Emergency Production Board orders.'

—George Yackulic in Western Business and Industry

Sugar Beet Mechanization

ACCORDING to Roy Bainer, Associate Professor of Agricultural Engineering in the College of Agriculture of the University of California, who has been tackling the two peaks of labor in sugar-beet production, machinery has been perfected which already has reduced from 78 to 55 the man-hours required to raise an acre of sugar beets.

The sugar beet seed ball is made up of from two to five seeds; by precision planting of only one seed from the ball, it is estimated that 5,000,000 man-hours of labor were saved in the United States last year. By means of mechanical thinning man-hours per acre were reduced from 27 to 2.45.

Once the seed is planted, and thinned, the time comes for harvesting. To save man-hours in this stage of production, a mechanical harvester has been developed after years of experimentation. With the use of this machine, labor requirements will drop from 78 man-hours per acre to 40 or 45, perhaps even lower.

The Oct. 17 issue of the **Lethbridge Herald** carried an editorial on 'Mechanization' which said: 'We note that in the Southern Ontario sugar beet district a new combine which digs, tops and loads the sugar beets into a truck is to be tested out this year. It is one of a number of various designs being tested in beet fields in U. S. and Canada. Segmentation of beet seed to produce single plants in the row; the use of the blocking machine to do the major job in thinning; the development of a combine for harvesting—all these advancements in sugar beet growing are being pushed in the expectation that in the future beet sugar may be able to compete with cane sugar in cost of production.

'This all means, of course, that less men will be required to grow and harvest an acre of beets. It is another step in the replacement of manpower by machine power. It is an indication of what is taking place all around the world . . . . '

The technological trend which has been emphasized by Technocracy for many years is accelerating.

(Continued from page eighteen)

claimed that 'although the chemical is now made at Buckingham, P.Q., Canadian match manufacturers place their orders with Uniform Chemical Co., in U.S.'

Tanning Materials — Regional monopoly was maintained through understandings between the dominant English group and small producers and exporters providing for fixed prices and export quotas, the report says. Canadian tanners 'could secure supplies through either of two designated agencies in the U.S.' A new agreement was reached in 1934 providing that 'the selling groups will receive instructions from the Control Office as to the quantities of each brand they may sell, and minimum prices to be demanded f.o.b. Buenos Aires.'

Magnesia Refractories—The report traces 'very close cartel arrangements' for these materials, under which the Canadian prewar market was reserved for Harbison-Walker Refractories Company. Under agreement, Canadian users were barred from securing high-grade magnesia refractories except from the two American manufacturers. European supplies were unavailable after 1939, but it was found possible to produce magnesia from brucite deposits in Quebec province, suitable for manufacture of refractory brick.

The report notes that after years of research in conjunction with the National Research Council, a Canadian Company, Canadian Refractories Ltd., 'succeeded in producing products competitive in cost and usefulness with those available in other countries.' But in May 1945 'a controlling interest in the stock of Canadian Refractories Ltd. had been acquired by Harbison-Walker Refractories Company of the U.S., one of the American corporations which had been a party to the cartel arrangements affecting Austrian magnesite.'

In documenting the case histories of the various commodities cited above, the McGregor Commission report provides classic illustrations of the operations of big business under the Price System rules of the game. It also demonstrates that cartel arrangements are attempts to maintain a Price System status quo in the face of rapid changes in the physical world. Cartelization is the natural protective process of the Price System to preserve itself in a world of advancing technology.

Advancing technology is creating a greater and greater abundance of goods and services. Because of the conflict between abundance and price, the Price System tries to throttle production in self-defense. To maintain prices, agreements are made to restrict production.

To protect vested interests, technological patents, inventions and processes may be bought and shelved. To create a greater market for commodities, they may be manufactured of less durable quality than could be produced by existing technological knowledge and experience.

A sample of the latter practice is to be found in a letter from a General Electric engineer to the executives of that company in 1932 (quoted by the McGregor report):

'Two or three years ago we proposed a reduction in the life of flashlight lamps from the old basis on which one lamp was supposed to outlast three batteries, to a point where the life of the lamp of the battery under service conditions would be approximately equal.

'Some time ago battery manufacturers went part way with us on this and adopted lamps of two-battery lives instead of three. This has worked out very satisfactorily.

'We have been continuing our studies and to bring about the use of one-battery life lamps—if this was done it resulted in increasing our flashlight business approximately 60%.'

The report also proves that the use of the term 'free enterprise' to describe the present system is a mockery and a sham. Big business itself has destroyed 'free enterprise' with cartel agreements to limit competition—many years ago in the case of some commodities. Seemingly caught off guard by the revelations of monopoly control in Canada, the **Vancouver Daily Province** admits in an editorial: 'Business men are loud in their demands that the government get out of business and allow full play for free enterprise. The cartel report shows that there is no such thing as free enterprise, and it is not governments that have extinguished it but business organizations themselves.'

An illuminating disclosure of the control wielded by 'business as a system of power' is the documentation on the plate glass cartel which states that 'the arrangements made by the cartel members . . . rendered the action of the Can-

adian parliament of no practical effect in relation to the trade in plate glass.'

The tie-up of a number of Canadian companies with the notorious I.G. Farben interests shows that Canadians were no different from Americans when it came to operating by the rules of the Price System game. Both Canadian and American businessmen played into the hands of Nazi Germany for the profits of this Price System. Moreover, they consciously or unconsciously attempted to install fascism in North America by 'the consolidation of all the minor rackets into a major monopoly for the preservation of the Price System.'

In studying the report in the light of Technocratic analysis, the citizens of this Continent are confronted with the cold realization that while they have defeated fascism abroad, they have not yet defeated fascism at home. North Americans must take measures even more drastic than were needed to win the war if they are to win the battle on the home front.

The first step is the Total Conscription of Men, Machines, Materiel and Money, with National Service from All and Profits to None. This will include conscription of patents, inventions and processes.

The next step is the elimination of the Price System in its entirety and the installation of a non-price social mechanism which will produce and distribute an abundance without any restrictions other than the physical limitations of natural resources and the capacity of the citizenry to consume.

Only when they understand that the cartel is a protective procedure of the Price System to preserve itself in a world of advancing technology, will North Americans introduce the measures which will destroy the monopolistic control that is attempting to freeze social change on this Continent.

—Donald Bruce

★ EVERY SENSITIVE HUMANITARIAN has reacted in horror to the savage atomic bomb. As a socialistic project under a New Deal brain trust of starry-eyed professors it is a flagrant example of the dangers of government meddling in the field of private enterprise. These same reformers now want a federal department of science to allow these same dreamers to continue their experiments, the end in view being, no doubt, to develop such new cheap sources of power as to undermine our way of life under private enterprise —Letter in San Francisco Chronicle

Technology Is Root of Unemployment

If production continues to level off no matter how slowly, and if the man-hour-per-unit production curve continues headed downhill, it follows that the total industrial employment stated in man-hours, which reached its peak about 1920, *must continue to decline.*

—TECHNOCRACY STUDY COURSE

IN THE Graphic Arts building of the Smithsonian Institution is a display of models of inventions which have changed world history, such as the metal plow, the automobile, the reaper and the airplane. A sign reads: 'Creative inventions make new products and **new industries create employment.'**

The writer of the sign expressed a common belief which has been fostered by much industrial advertising. Opposing such a theory as that embodied in the sign, however, is the fact that an employment breakdown and something approaching national economic collapse came in 1931-32, in an era when scientific progress had reached a new high in world history.

Among inventions that had produced new industries during the preceding 50 years were the automobile, airplane, disk plow, steam turbine, sensitized photograhphic paper, wireless telegraph and telephone, ductile tungsten for electric filament lamps, high-octane gasoline, pneumatic tire, X-ray, internal combustion engine, nitrocellulose lacquers, high-pressure lubricants, television, rayon, nylon, wood pulp paper and scores of others.

Yet millions could not find jobs and in 1932 business failures were the highest in the country's history. In March, 1933, employment reached a new low of 12,000,000 below the 1929 average and did not recover to the 1929 figure until World War II approached.

The relationship of inventions to unemployment is not fully determined. However, it is clear that inventions and development of new industries do not automatically increase the net amount of employment, otherwise jobs would have been begging for men in 1932-33. There is strong evidence that advancing technology tends to cause a net decrease in employment because of the ability of machines to produce more goods with fewer workers.

The Machinery and Allied Products Institute gives assurance in a pamphlet that 'the net result of technological advancement is a great increase in employment,' but the decade of depression, 1929 to 1939, closed with production at an all-time peak while 9,000,000 were unemployed.

This publication could be filled with examples showing that improvements in machines and processes result in unemployment when government does not take proper measures to spread the benefits machinery should provide.

'In 1933,' says the National Industrial Conference Board, industry's own spokesman, 'we used fewer man-hours of labor in manufacturing industries than we did in 1899, and in 1938 we fell once more below the 1899 level.' Meanwhile, our population of working age had been increasing more than half a million a year.

A coal mine employing 800 men installed a loading machine and displaced 500 of them.

In the steel industry, one or two men with the aid of machinery replaced 12 to 20 men unloading by hand.

In cigar making, four operators with machines produce the equivalent of 15 by hand.

One wrapping machine with one operator replaces as many as 40 hand wrappers.

The steel mills have introduced machinery that permits 1,600 men to do the work formerly done by 32,000.

In railroading, ton-miles handled have gone up but employment has gone down.

The phenomenal expansion of the aircraft industry after Pearl Harbor was accompanied by a 200% increase in output per man-hour.

In 1830 it took 268 man-hours to produce 100 bushels of wheat on five acres; and by 1930 40 man-hours were sufficient to accomplish the same result.

Typical of what is happening on farms, a planter in the Mississippi delta bought 22 tractors and 13 four-row cultivators and dismissed 130 of his 160 sharecropper families.

A Western Union device known as a 'floating switchboard' operated by six persons, automatically routes telegrams anywhere in a large district, doing the work of 49 persons.

An advertisement of a business machine company states: 'Wrigley cuts force from 100 to 8 girls. Will

save for you proportionately.'

An electric eye device inspects automobile engine wrist pins, doing the work formerly done by 10 to 20 persons.

In 59 manufacturing industries the output per man-hour increased 91% between 1919 and 1938, according to figures taken from a Department of Labor report.

Jobs requiring perception of weight, size and form have been taken over by machine-tending instruments. Other instruments control machine operations on the basis of temperature; and the electric eye, previously mentioned, can control by sight. Another, the televix, controls by sound.

The National Resources Committee reported that 'Manufacturing, aided by these registered and controlled devices, will develop further toward the straight line process and full automatic operation.'

There is no limit to the possibilities of automatic devices, and there is every indication that no matter how much production is increased, employment will tend downward, unless government takes appropriate action. Chief such action required is reduction of hours of labor and increase in the hourly wage in order to spread work and maintain purchasing power. Shorter hours and higher wages are not the sole preventive of another depression, but they are basic.

The late Senator Charles McNary of Oregon, Republican leader, certainly not an alarmist, made the startling statement that unemployment is a permanent problem, the most serious facing the nation, and that it must be met by national action.

The war provided full employment—temporarily. Current purchasing power and pent-up demand for goods and services may temporarily provide something near full employment in the immediate postwar period. A permanent solution depends to a large extent upon recognizing the economics of a machine age and distributing work and wages to fit facts.

The greatest drag upon progress toward a solution of unemployment is the refusal of many industrial agencies to admit the importance of technological unemployment. The U. S. Chamber of Commerce, for instance, hardly mentions elimination of jobs by machines in a pamphlet on postwar readjustments entitled: 'Absorbing the Total Labor Supply.'

Machinery manufacturers express fear of attempts to repress new labor-saving devices by tax or other methods. In their literature they picture machine-smashing orgies by excited mobs of displaced workmen in England during the Industrial Revolution.

Inventions are the source of comforts for the common man such as kings of old could not enjoy. Scientific progress and machinery were a prime factor in winning the war. Invention should be stimulated, not curbed.

But the replacement of labor by machinery has accelerated as compared with 50 years ago. The use of machines for producing power in great quantities at low cost is relatively new. More progress has been made in generation of electricity in the last 20 years than in the preceding 2,000, according to General Electric Company. The steam turbine has been developed to a point where it produces a kilowatt-hour of electricity for the burning of less than a pound of coal; and there are engines that develop more than a horsepower per pound of their own weight.

In 1837 only 436 patents were issued. Now 40,000 to 50,000 are issued yearly. The increasing rate of invention goes hand in hand with increase in production per man-hour in agriculture, manufacturing, mining and related industries.

Solution of the machine age unemployment problem will come surely when industry joins with labor in taking the realistic view that machines displace more workers than they employ.

'Knowledge is power,' says an old proverb. Unemployment won't be eliminated unless our people become aware of its basic cause, advancing technology.

—R. A. Seelig

EDITOR'S NOTE: *This article appeared in the November,* 1945, *issue of the following labor magazines*: MACHINISTS MONTHLY JOURNAL, *official organ of the International Association of Machinists, A.F. of L.;* BROTHERHOOD OF LOCOMOTIVE FIREMEN AND ENGINEMEN'S MAGAZINE; RAILWAY CLERK, *journal of the Brotherhood of Railway and Steamship Clerks, Freight Handlers, Express and Station Employees.*

Labor unions are becoming aware of the basic cause of unemployment and are fighting for a shorter work week and a higher hourly wage. Unfortunately for them, the Price System dooms their efforts. The working of the Price System forces the manufacturer to reduce the total number employed rather than to distribute the amount of time required among the total number of available workers. Through increased investment in machines—made necessary by the increasing rate at which they go out of date—the manufacturer is forced to reduce the proportion of his costs which goes to labor. This works against the increase of wages and the distribution of time. Technocracy has the only solution to this social problem.

Our Daily Bread

On the rock of science and technology we must erect a new civilization of abundance for all; a new culture in which the material things of life will be so taken for granted that it will seem incongruous to pray: 'Give us this day our daily bread.'

FOR 2,000 years we have been taught to pray for our daily bread and it is the only material thing that is mentioned in the Lord's Prayer. We may presume that the expression 'daily bread' covers all the actual necessities of life; it could hardly mean less and certainly not more, because in the days when that prayer was written there were few luxuries. Long before the dawn of history, when man first began to compete with the other animals of the forest and jungle, the acquisition of his daily bread was a matter of overwhelming importance and today it is still the most sought-after item in our material existence. In order to get their daily bread, men have endured and still endure incredible hardships and discomfort; it has been the root cause of every kind of crime and every form of socially undesirable behaviour; it has been the motif behind innumerable wars and the lack of it has been and still is responsible for hatred and suspicion between men, for most of man's misery, degradation and despair.

The people of North America are living at present under a Price System—the system in which goods and services are distributed on a price valuation. When they get anything or let go of anything they expect to give or receive money in exchange. They buy and sell things, and it has occurred to but few of them that there could be any other way of transacting their affairs. They work at producing things; they are paid for their work and with their wages and salaries they buy back some of the things they produce. When they can all work and receive wages, they can buy their daily bread in fair amounts.

Just as long as they get enough daily bread to meet their actual needs, with an occasional dab of jam on it to keep them in good humor, they will continue to behave as they have in the past.

When subjected to enough propaganda most people can be

induced to believe almost anything, but there is a limit even to the power of propaganda. It cannot persuade a starving man that he is well fed, that a park bench is as comfortable as a room in a hotel or that a worn-out sweater is just as warm as a fur-lined coat. There is a limit also to social tolerance; the citizens of this Continent nearly reached that limit in the Great Depression. Those were the days when they organized hunger marches and slept in post offices; when they worked in labor camps for 20 cents a day and their board. In order to forestall riots or worse the Governments of Canada and the United States spent billions of dollars on direct and indirect relief. People were given just enough bread to keep them quiet—and there wasn't any jam on it.

Thanks to lavish Government spending, conditions improved to the extent that in 1937 it was considered safe to cut down on relief; immediately this was done another depression started and was becoming quite serious when the threat of war intervened and saved the situation. During the war the majority got more daily bread than for the previous ten years, and so collectively they were contented.

Now that the war is over, the continued operation of the Price System will be governed by the extent to which people can be employed in peacetime industry. How to maintain full employment under a Price System is the economic headache which is at present plaguing our political, business and economic leaders. Every waking hour we are deluged with a flood of vague generalities and moralistic nonsense, designed to secure our support to some scheme for re-establishing full employment within the framework of the Price System.

Technocrats are not impressed by platitudes, promises or predictions based on wishfu thinking no matter how exalted the source from which they emanate. Measurable facts which are available to all persons demonstrate that the Price System can never again provide full employment on this Continent in the generally accepted use of the term.

Technocrats are not worrying about full employment, but they are concerned with the problem of eating regularly. They realize that we will not get our daily bread by the same methods as we obtained it in the past; that we

will not be able to work for it and we will not be able to buy it; that we will have to accept it as naturally and freely as the air we breathe, without money and without price.

To most people this sounds fantastic. It is contrary to their established ideas, opinions and convictions. For centuries they have earned their bread by the sweat of their brow, and that is the way they want to continue earning it. They have done things the hard way so long that they cannot imagine any other way of doing them.

But they must realize that the world of today is very different from the world of yesterday and it is changing faster all the time; the main difference between the world of yesterday and today is the way we do things. The revolution which was started when Watt set up the first workable steam engine is now approaching its culmination—that revolution has taken place in our workshops, our industrial plants, our laboratories and our farms. Unfortunately, we have not so far been able to make the social readjustment necessary to accommodate it.

The progressive increase in the use of extraneous energy plus the increase in the efficiency of the methods by which we utilize it ordains that any given amount of production will require fewer man-hours of human effort tomorrow than it does today. This trend is irrevocable and irreversible. No one ever designs, builds, or markets a machine which is less efficient than the earlier model; no industrial plant ever discards an electric motor in order to employ more men. Every employer of labor has to conform to this trend, regardless of his wishes. Efficiency in any language means less human effort.

Having built a high-energy social mechanism, the people of North America have to keep it in operation. If any financial or political considerations interfere with its functioning and drastically curtail its output, then a large number of persons will stop getting their daily bread, and worse than that, some of them will stop living. That is why Technocracy has undertaken the task of preparing the citizens of this Continent for a different method of getting their daily bread.

For a little longer, most of the people will go on believing that they can always earn their bread

by the sweat of their brow; that they can buy back with their wages the daily bread that our Continental plant can produce so plentifully without much help from us; that a mass expression of opinion at the polls has some bearing on the physical operations of a mechanical world. Then the pressure of physical events will force them to the realization that they cannot operate our high-energy social mechanism with Price System methods.

How can we perpetuate the traditional scramble for our daily bread, standing as we probably are on the threshold of atomic power?

We, the people of North America, carry a tremendous responsibility. The application of physical science to the means whereby we live renders futile and ludicrous the frantic efforts of our so-called leaders to halt the progression of events, a progression which is taking place so rapidly that even the social reform programs of the radicals are inadequate to meet the situation. On the rock of science and technology we must erect a new civilization of abundance for all; a new culture in which the material things of life will be so taken for granted that it will seem incongruous to pray: 'Give us this day our daily bread.'

—J. H. Soans

★ WHAT IS HAPPENING TODAY in the United States of America? Only a tiny fraction of the enormous expenditure of capital, material and labor is being devoted to the peacetime uses of atomic energy. Well over 90% of the effort goes to producing bigger and better bombs for an undefined purpose. President Truman regards this as a sacred trust. Why, then, does he not concentrate on the cheap production of power through the release of atomic energy, in which case in a comparatively few years men would no longer have to go down into the belly of the earth to hew coal, oil could be outdated, gigantic schemes of irrigation could make the desert blossom like the rose? Moreover, there is a tremendous medical side to the release of atomic energy. By it a radio-active species of every chemical element can be prepared which would be of inestimable value in medicine, both for the purpose of research, for diagnosis and for therapy. If, by building bombs instead of by ending men's drudgery and by solving the secrets of nature, the President thinks that he is discharging a secred trust, then he must be mistaking Lucifer for the Almighty. —Captain Blackburn, Labor Party M.P. for Kings Norton

★ THE CHARGE AGAINST PRIVATE ENTERPRISE is not that it falls down as a producer but that it has failed to evolve a system for continuously distributing its product and, as a result, is in perpetual danger of choking itself to death.
—Keith Hutchison in *The Nation*

So You Can't Change Human Nature!

Can we or can we not change 'human nature'? . . . Investigation reveals that man's development has been a course of constant change, both mentally and physically . . . We must change if we are to continue to exist upon the earth.

THE surface of the earth, with all its precious cargo, travels at a speed of more than 1000 miles per hour, day and night. The whole planetary system whirls through space at 50,000 miles per hour. And it is no idle rumor that, when uranium atoms are forced to split, the blast of flying neutrons lets loose an explosive surge at a velocity of millions of miles per second. Everything in the external world is in a constant state of motion. Yet, for some reason known only to gremlins, gew-gaws and golliwogs, 'you can't change human nature.'

What is said is said. This pearl of prosaic wisdom has been uttered with profound solemnity and there is no recourse. Other intellectual gems of imposing import are 'women are women,' 'boys will be boys,' and the daddy of them all 'business is business.'

There is something about all these profundities that carries weight. They can be said with an air of conclusiveness. Matters of great pitch and moment can be settled with dispatch. Quite often 'troublesome individuals' who dare to think for themselves can be effectively silenced. These magic phrases are quick, handy and pert—**and are generally repeated by people who are too lazy to think.**

Now, is that not a rather nasty anti-climax to spring upon an innocent reader—and so early in our discourse too? Possibly, in the interests of mental calm, such impacts should be avoided.

But we are not interested here in mental calm. Events are moving at such a rate in the world today, the social plane is shifting so fast, that lethargic thinking and trite sayings have become dangerous. Our mental calm needs a bombardment so that our social thinking can be brought into phase with the world which is evolving about us. This is the Power Age and all our previously conceived notions must come up

again for review. Can or can we not change 'human nature'?

Those that assert that 'human nature' cannot be changed must presuppose that there is something fixed and given that can be called the nature of man; that man, as a species, appeared upon the earth in his present state and will conclude his earthly existence in complete conformity with the detailed specifications of the original sample. They must also assume that men individually do not change in 'nature' from birth to death.

But is this 'nature' constant and fixed? Investigation reveals that man's development has been a course of constant change, both mentally and physically. For those who do not care to think of an anthropoid ancestry we cite the fact that the North American soldier in the war just concluded is, on the average, three quarters of an inch taller than his ancestors of the 1914-18 conflict (there were a third more six-footers). This is change in physical structure.

From birth to death how does man change?

As the stimuli of his changing environment play upon his nervous system (setting up reflexes) and as the excretions of his endocrine glands vary in quantity and quality, the individual man experiences a changing pattern of behavior. A boy who has been born and raised on a remote country farm will undergo very extensive changes in behavior if transplanted in the environment of a large city. A normal adult whose thyroid gland loses the capacity to produce thyroxin will become a coarse-skinned, slow-thinking individual with little vitality.

But those who maintain that 'you can't change human nature' usually mean much more than that man does not change. For political, economic, religious or philosophical reasons they wish to convey the impression that the world does not change, that society does not change, that the economic order cannot and does not change. The use of this cliche in itself reveals an attitude of mind, a concept of society and a whole philosophy of life.

All the evidence we have, however, proves this presumption to be nonsense, either mistakenly or maliciously c o n c e i v e d. The world is constantly changing, the animal species change, social and economic forms change. Men live in environments which change,

and these changes alter human behavior.

Man began his long pilgrimage toward the present Power Age when he chipped his first flint tools and hammered out his first bronze or copper knives. With the cultivation of plants and the domestication of animals, the hunter eventually became the herdsman and farmer. The records of antiquity show that the first use of auxiliary power was effected through the advent of wind and water mills. Then came Watt's steam engine which heralded the advent of the Power Age.

The physical environment of mankind has been more radically transformed during the past hundred years than in the previous thousand. This is a fact that carries tremendous implications.

For example, let us consider transportation. In the more developed sections of the world today we no longer rely on the ass and the horse, the ox and the buffalo, the elephant, the camel and the llama, the caribou, or the dog. Indeed, the automobile is now outmoded in many fields. Consider the giant passenger planes in the airlanes of today. Think of the possibilities of jet propulsion; of travelling at a speed greater than that of sound somewhere outside the earth's atmosphere. Can you picture a cave-dwelling representative of the Stone Age piloting one of these rocket-motored craft into the stratosphere?

How can anyone view changes of such magnitude all about us and still deny a change in the habits and behavior of man?

In 1837, more than a month elapsed after the death of the English King before the people of North America learned that Queen Victoria had assumed the crown. Today, our newsgathering agencies have hardly the decency to allow rigor mortis to set in before the wires everywhere are abuzz.

In the face of such changes it is hard to credit the existence of people who maintain that 'human nature cannot be changed.' But we have them with us today just as they haunted the decades before. Many times their attitude has resulted in deliberate sabotage of technological advancement. Other times it has appeared as amusing ignorance.

When Commodore Vanderbilt was approached on the subject of adopting an air brake for his rail-

way, the New York Central, he dismissed Westinghouse, its inventor, with the remark that he had not time 'to waste on such nonsense as stopping trains with air.'

Faraday, explaining the principle of alternating current to a financial tycoon of his day, was asked skeptically what use his discovery might be to the business world. 'You can tax it,' was his terse reply.

Ahead of us lies an age of atomic energy. Already we see a deep cleavage developing between the attitudes of technology and business toward the new discovery. Technologists envisage a day when homes will be heated and lighted at extremely low cost, factories powered at a fraction of the present expenditure, and a general boon accrue to society. But this will spell doom to profits, so we find many businessmen viewing the future with fear and foreboding.

Some of these latter are the same people who parrot the platitudes of yesterday—'there have always been wars and there will always be wars,' 'business is business,' etc. (This sweeping statement on war is a clear indication that its mouthers do not understand the causes of war. 'Business is business' can only mean that business practices may require sharp dealing and socially objectionable behavior, but nothing can be done about it—e.g., selling scrap iron and oil to our fascist enemies in 1938-39, maintaining cartel agreements to limit production and shelve patents.)

Every day it becomes more obvious that the functions of technology and business are incompatible; every day the gulf between scientific purpose and business practice widens. The new surge of science decrees not only the elimination of toil, scarcity and disease but the eradication of all business concepts from our behavior pattern in North America. We must adopt a new technic of social operation, a form of control mechanism which will be in full intellectual and technical accord with the requirements of the Power Age.

In previous paragraphs we have established the fact that 'human nature' alters in a changing environment. But we have also made one other important observation. **The physical environment in North America has been more radically transformed during the past hundred years than in the**

preceding thousand. Change today is proceeding at an unprecedented rate.

The question now arises: Are the changes in our social behavior keeping pace with our changing physical environment? If they are not, catastrophe is in the making.

Scientific research carried on by Technocracy Inc. over the past 25 years points with alarming conclusiveness to the fact that advancing technology is forcing Price System institutions into obsolescence and eclipse. Are we preparing ourselves for what is to follow?

Now is the time to clear away all the mouldy pettifoggery from our mental processes. Learn the method now—condition yourself to think scientifically. This is the only safe way to live in a technological society.

All recorded history, biology and anthropology tends to verify the thesis that, when an organism or group of organisms function in harmony with their changing environment, they thrive. Conversely, when any group of organisms (man included) seek to ignore or contravene the changing environment, the organisms—not the environment—are destined to extinction. Nature employs a stern code.

Too often the natural evolution of public thinking is hampered by spurious catch phrases. The slogan 'you can't change human nature' is today a key device for maintaining the present social and political structure, even though it may rest as an antiquated fossil upon a philosophical anachronism. It is a rallying cry against progress.

Fascism is the attempt of an organized body of vested interests (political, financial and clerical) to freeze social change and preserve the status quo. Don't be caught giving lip service to fascist propaganda. 'Human nature' can be changed. Human behavior is changing continually. In fact, man's entire approach to social affairs **must** be changed to conform to our new physical environment if we are to continue to exist upon the earth.

—C. Warren Lowes

★ IT IS TECHNICALLY POSSIBLE to produce enough material goods so that all men everywhere may be adequately fed, decently housed and comfortably clothed . . . The question is whether our arrangement for exchange and distribution will be such that these enormous productive powers are enabled to operate freely for the benefit of everyone. —PRESIDENT TRUMAN

TECHNOCRACY

WHAT?

Technocracy is science in the social field. *Encyclopedia Americana* says: 'Whatever the future of Technocracy, one must fairly say that it is the only program of social and economic reconstruction which is in complete intellectual and technical accord with the age in which we live.'

WHEN?

Technocracy originated in the winter of 1918-1919 when Howard Scott formed a group of scientists, engineers, and economists that became known in 1920 as the Technical Alliance—a research organization. Some of the better known names in the Technical Alliance are of interest, such as: Frederick L. Ackerman, architect; L. K. Comstock, electrical engineer; Stuart Chase, C.P.A. (now well-known writer); Bassett Jones, electrical engineer; Leland Olds, statistician (now Federal Power Commissioner); Benton Mackaye (now in the Forestry Department); Charles P. Steinmetz and Thorstein Veblen (both now dead). Howard Scott was Chief Engineer. In 1930 the group was first known as Technocracy. In 1933 it was incorporated under the laws of the state of New York as a non-profit, non-political, non-sectarian membership organization. In 1934 Howard Scott, Director-in-Chief, made his first Continental lecture tour which laid the foundations of the present Continental membership organization. Since 1934 Technocracy has grown steadily without any spectacular spurts, revivals, collapses, or rebirths. This is in spite of the fact that the press has generally 'held the lid' on Technocracy, until early in 1942 when it made the tremendous 'discovery' that Technocracy had been reborn suddenly full-fledged with all its members, headquarters, etc., in full swing!

WHY?

Technocracy's survey of the economic situation in North America leads to the conclusion that there is in development a process of progressive social instability, that this process will continue until the instability reaches the limits of social tolerance and that there then will have to be installed on this Continent a social mechanism competent to meet the needs of its people. Technocracy finds further that the day when social operations on this Continent can be based on a method of valuation has passed, and that it is now necessary that there be applied in the social field the quantitative methods of physical science. Technocracy, therefore, proposes that the North American Continent be operated as a self-contained functional unit under technological control. This control would operate the area under a balanced-load system of production and distribution, whereunder there would be distributed purchasing power commensurate with the resources and the continuous full-load operation of the physical equipment, with the guarantee of a high standard of living, equality of income, and economic security, at a minimum of working hours, to every adult inhabitant.

HOW?

At this stage the objectives of Technocracy are first, the education of the people of North America to a realization of the conditions behind the social crisis, and second, the organization of all those willing to investigate and interest themselves into an informed, disciplined, and functionally capable body whose knowledge and ability can be called upon to prevent chaos in North America at that time, now imminent, when the Price System can no longer be made to operate.

A Pax Technologica

TODAY THERE ARE ONLY TWO really great military powers on earth—Russia and the United States. Russia has emerged from the war a victorious continental organism; United States has emerged from the war victorious, but an incomplete continental organism. In the world of today and tomorrow only one continental organism can exist with another without conflict or competition. Any attempt to maintain the peace without the existence and cooperation of the continental organism of North America and that of Russia will be a flat failure. Only the offensive and defensive alliance of two such organisms can secure world peace. The world of tomorrow will be a world of continental organisms—a Pax Technologica.

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TECHNOCRACY DIGEST

We Need a New Calendar

Witchcraft in Economics

The New Energy

Facts About Plastics

A New Role for Science

Whither Glass?

Canada's Construction Industry

Final Report on War Production

1946

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THE ONLY MAGAZINE IN CANADA THAT IS PREPARING THE PEOPLE OF THIS COUNTRY FOR SOCIAL CHANGE.

FEBRUARY, 1946 VANCOUVER, B.C. No. 92

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A New Role for Science

North American science remains shackled by private enterprise . . . Technocracy will have the march of events moving swiftly at its side in demanding that science achieve a new and dominant role in human affairs.

SCIENCE, symbolized in the unleashing of atomic energy, provided the greatest news of 1945. Realization that it was science that brought us the new discovery, plus all the countless other milestones of our physical progress, should be enough to provoke the interest of a rapidly increasing number of persons in the social implications of science. That such an awareness is most necessary is apparent when we analyze the place accorded science and the men of science in our society today.

The San Francisco Conference in the spring of last year typifies the attitude which has prevailed until now. The United States Government invited representatives from hundreds of American organizations. The Kiwanis, the Rotarians and the Lions were there. And, of course, the National Association of Manufacturers was there too. In order that every literate person be informed of the proceedings, there were more news reporters for the press and radio at hand than actual delegates to the conference. Technocracy, however, points out that the world statesmanship at San Francisco made very certain that it was not embarrassed with the participation of the men who have built modern civilization, who won the war and who are responsible more than any other group for the social problems of the postwar world. Not one scientific or engineering body was invited or represented at the conference.

It is clearly evident that while world statesmanship may approve of the advancements that science is making, it is not yet prepared to alter the position of science in society. (There is only one major exception to this: the Soviet Union, which has a highly approving, constructive attitude towards science and its function in that country's operations.)

In spite of Price System interference, the march of science and

technology on this Continent has outdistanced that in any other area of the world. In the direst days of World War II, as the swastika and the rising sun threw perilously lengthening shadows, many North Americans hoped and prayed that the men of science could find a way to bring us victory. In a war permeated with technology, we read breathlessly of research and production miracles. Never was a Continent so grateful for its supply of scientists, technologists and engineers. In view of their magnificent record of achievement despite the obstruction they have always encountered, can we afford to let science remain an incidental part of our national operations?

North America today has the world's greatest array of technological equipment. The war we have just concluded has accelerated every trend towards a technologically operated society. The social problems of Price System dislocation which are with us now, and which will become increasingly severe, cannot be solved through the age-old methods of politics and business. The methods of science applied so successfully to physical apparatus must be applied to our social operations.

A group of scientists and technologists have long since applied the methods of science to the social order. The body of thought they represent, now known as Technocracy, is fully aware that social engineering must be adopted in North America, and that this procedure is so different from past concepts that it will be tried only when our economy becomes so unstable as to imperil the well-being of our entire citizenry. That critical time is now near at hand.

Technocrats are therefore pleased that the major news event of 1945—the story of atomic energy—has caused a new awareness of science and its place in society. Scientists themselves are becoming conscious of their social responsibilities. It is time that this occurred.

Technocracy will have the march of events moving swiftly at its side in demanding that science achieve a new and dominant role in human affairs.

—Milton Wildfong

★ THE 1945 CANADA YEAR BOOK is now available and will be supplied to the public by the King's Printer, Ottawa, at the price of $2.00 per copy.

We Need a New Calendar

The calendar we are using today was not designed to meet the exacting requirements of our modern technological society . . . The Technocracy calendar is a typical example of the social changes that have been made necessary by advancing technology.

TIME, whether we realize it or not, is so closely interwoven with our every thought and action that we all perform our daily and various tasks in complete compliance with it. Marching inexorably forward, time measures the span of our lives and records individual, communal, national and world affairs.

The calendar is a mechanism for the measurement of time and the recording of events. It is one of the most important institutions that has been devised by man. Without the calendar, society would never have progressed to its present state of development. If we were to be suddenly deprived of the calendar and knowledge of its use, we would soon be laboring in a hopeless labyrinth of unrelated events. Every action would be one of isolation, without direction or focus. The calendar correlates the past with the present and the future. It keeps order among the events in our lives. It is a control mechanism.

The calendar we are using today was not designed to meet the exacting requirements of our modern technological society and as a result there are oscillations and bottlenecks in our social operations. Obsolete machines and instruments are not tolerated. We shall see that our present calendar is also outmoded. A new time-plan is needed if society is to progress.

In order to understand the function of the calendar and how it came to have its present form, let us turn to history and trace its beginning. Like any other scientific innovation we find that it has had to change and develop in the face of opposition from man because of his innate resistance to change and superstitious regard for previously established customs and habits.

Soon after man appeared on this earth he must have become aware of the regular and recurrent periods of light and darkness which we call day and night. He

used his days for hunting and foraging for feed and his nights for sleeping and resting for the next day's hunt. These light-dark periods were given names such as 'suns,' 'darks,' 'sleeps,' or some similarly relative term. Because of the regularly recurrent nature of these light-dark periods he developed the ability to use them as a means of measuring the time. He could measure and record the events in his life and relate the past with the present. He could state that he killed the musk-ox four suns ago, or that he travelled three sleeps without eating. Scientists and historians tell us that primitive man gathered sticks and stones or cut notches in trees or poles to record the number of passing days.

Since man is a slowly evolving creature, this early reckoning of time by light-dark periods probably lasted for centuries. By degrees, however, he became conscious of the changing phases of the moon. It waxed and grew full, waned and disappeared, only to reappear and grow again. He noted that this natural phenomenon occurred with unfailing regularity and realized that here he had another means of measuring time. It offered a much more convenient means of measuring longer periods. It was much simpler to recall the number of moons that had passed since his eldest son was born or that the cave bear ate his mother-in-law than to remember the number of suns that had gone by overhead. This regular progression of the moon's changing phases was man's celestial clock and became the basis for his first calendar. By the moon the years were recorded and generations of men were recorded.

Scientists have found evidence that the moon calendar was used by man in all parts of the world. It was not, however, used in the same manner in all communities. Some began their months and years with the new moon, others with the full moon. Since most communities in early times were more or less isolated from each other, these differences did not matter greatly. It is significant to note that in all parts of the world where man lived, whether in India, China, Europe, Babylon or America, the moon calendar appears to be the generally approved method of counting time.

As time went on man's living habits changed. From hunting and roaming for food he became

a herdsman and agriculturalist. With the need for tilling, sowing, growing and harvesting of crops he became keenly aware of nature's regular and rhythmic seasons. This knowledge was vital to him because it enabled him to sow and increase his crops with greater assurance of success.

It takes little imagination to realize the far-reaching influence this had on man's entire life and his many activities. And yet, this knowledge came gradually, first to the few, then to the many. The overcoming of the old idea that the moon directs time and all that it implies, and the acceptance of the new, that the sun influences the seasons and directs the years and therefore is a more dependable time-recorder, was not received without opposition. The old, which is habitual, exerts a tenacious hold on man. And man, being a creature of habit, resists change.

It is reasonable to assume that man lived and counted by moon calendars for many centuries before he advanced to another step in his development and would accept a newer and better time-measurer, one that was more reliable than the changeable and inconsistent moon. Some sections of the world's population base their calendars on the moon even today. The Jewish calendar consists of 12 moon-months, each of 29 or 30 days. In order to keep their calendar in step with the seasons an occasional 13th month is inserted. The Mohammedan calendar is based on the moon alone and disregards the seasons entirely. It consists of 12 months of 29 or 30 days, and the year, being only 354 days long, moves nonchalantly through the seasons and coincides with them only on rare occasions.

The early Egyptians were among the first peoples, according to historians, to develop a sun calendar. They also had a traditional star or siderial year calendar based on the heliacal rising of the Dog Star, Sirius, that came between the earlier moon and the later sun calendars. The stellar calendar had 12 months, each having 30 days. It was a decided step forward and proved more reliable than the previous calendar. The change, however, was not complete.

As early as 4326 B.C., as determined by Borchardt according to the late Professor James Henry Breasted, the sun calendar of 365 days supplanted the transitional

star calendar. It was only after painstaking and determined effort lasting many years and involving the use of elaborate and imposing structures and instruments that the Egyptians were able to determine (what they considered) the exact length of the year. This new seasonal calendar of 365 days retained the 12 months (each of 30 days), which were subdivided into 3 decades (or weeks) of ten days each. The remaining 5 days were added to the end of the year, considered as feast days and placed under the control of the priesthood. All previous moon associations with the calendar were completely discarded. The new sun year became the longest time-unit known to these ancient people and was recorded according to the reigns of chiefs and length of dynasties.

The recognition of the passage of time now became a prime necessity of social life. In learning how to record the passage of time, man learned how to measure things. He made structures of much vaster scale than any which he had employed for merely domestic purposes. The arts of writing, architecture, numbering, and in particular, geometry (which was the offspring of star lore and shadow reckoning), were all byproducts of man's first organized achievement, the construction of the calendar. Science began when man first started planning ahead for the seasons. Planning ahead for the seasons demanded an organized body of continuous observations and a permanent record of their recurrence.

The new calendar was under the protection of the rulers, the scientists (who made the astronomical observations) and the priests (who used it to set the religious feast days and festivals). These three groups combined to guard it zealously from other alien communities. The advantage accruing to a people possessing this calendar can be readily seen. In knowing when to plant and cultivate their fields, they could almost always be certain of greater yields. Consequently they would be better nourished and more prosperous. As a result of this policy, Egypt became one of the most powerful nations of ancient days.

The Romans, separated from the Egyptians only by the Mediterranean Sea, were far behind their neighbors in knowledge and culture. It was about 35 centuries

after the Egyptians first used their sun calendar that the Roman calendar started as a moon calendar of 10 months. The peace-loving dictator, Numa Pompilius, who ruled over Rome for 43 years—715-672 B.C.—added an 11th and a 12th month to the year and unlike the Egyptians who merely numbered their months, gave them names. Many of those original names grace our calendar today.

Realizing that the moon calendar of 12 months was too short for the seasonal year, Numa Pompilius authorized the addition, or 'intercalation,' of an occasional 13th month. Instead of recognizing the civil and social nature of the calendar as had the Egyptians, and sharing the responsibility among ruler, scientist and priest, he restricted the responsibility of keeping the calendar adjusted to the College of Pontiffs, a group of priests. The priests watched for the coming of the new moon and announced at the first of each month how many days would pass before the moon would become full and which days were to be days for worship and which days were legal for transacting business. The priests also decided how many months there should be in each year.

At length, politics began to play a part in the Roman calendar. Occasionally, in order to prevent an official who did not enjoy their favor from holding office for 13 months, the priests omitted to add the extra month. In the same way, in order to keep a favored official longer, the priests added a 13th month to a year which should have had only 12. Again, by jealously keeping the calendar out of reach of the public, they could force the people to pay tithes in order to learn which days of the month were legal for transacting their business. The priests were aided and abetted by the magistrates of that day in this calendar domination because the magistrates could levy fines on any poor unfortunate who tried to do business without first determining the correct days and happened to pick a wrong day for his business.

To Cneius Flavius, son of an unknown slave, belongs the gratitude of civilization for having freed the calendar from the domination of a privileged group—in this instance, priests and magistrates. By some means unknown to us, Flavius succeeded in ob-

taining a copy of this precious calendar with its prohibited days and dates, and listed them on tablets about the Forum. This unprecedented and highly courageous act, about 304 B.C., aroused immediate public attention and approval. The priests and magistrates were indignant at losing their former prerogatives by this flagrant act of publicity. They devised new codes and tried many other subterfuges, but to no avail. The deed was done. The calendar had come out from its inner sanctum for all to behold. The calendar had once again become free, had taken another step forward, for itself and its users.

This emancipation, however, did not eliminate confusion from the Roman calendar. Because of their superstitious belief that even numbers were unlucky, the Roman's regular twelve month year had seven 29-day months, four 31-day months and one 28-day month. The new moon shifted its position slightly each month, and in spite of the extra month which the priests had put in, the months which were supposed to be winter months became autumn months and the summer months were carried back into the spring. After a few hundred years the Roman calendar was hopelessly confused. It was a most haphazard instrument whereby nothing could be planned with ease and accuracy.

When Julius Caesar became the ruler of the Roman Empire, he decided to reform the calendar so as to eliminate political manipulation, and to bring it to some semblance of order and stability. He got many of his ideas for the new calendar from the superior sun calendar of the Egyptians. The Julian reform added enough days to the twelve regular months to complete the year and dropped the intercalated 13th month entirely. Caesar also determined, with the aid of astronomers, that the length of the year was 365¼ days, so the Julian reform incorporated the leap year rule of making every fourth year 366 days long, with the extra day added at the end of February.

Julius Caesar was most anxious to have the year start with some seasonal beginning, and chose the winter solstice, December 25, to be the first day of the year. But again the people resisted change. They had become accustomed to beginning their year on January 1, the date when their consuls, or ruling officials, assumed their

annual civic duties. The traditional moon, also, had greater importance to them than the new and strange sun year. By a curious coincidence, on the year of the adoption of the Julian reform—45 B.C.—a new moon fell on January 1, the same day the consuls took office. To placate the populace, Caesar compromised, and as a result we are still celebrating New Year's Day out of step with a seasonal beginning.

In the year 321 A.D. a far-reaching change was made in the arrangement of the calendar itself, without altering its scientific accuracy. The change was an internal one, its significance not grasped at the time.

Emperor Constantine the Great had been converted to the new religion that was sweeping Europe. He had become a Christian. Wishing to honor the Christ and to accept the seven-day week with its regular day of rest, he officially decreed the week to be part of the calendar and at the same time he designated the first day of every week — Sunday — the Christian day of rest, prayer and worship. The week had become Christianized.

The period of **the week** is the next accepted period of time above the day. But while **the day** is characterized by distinct phenomena which limit its length, the week has nothing of this kind which could not belong equally well to a period of 4, 5, 6, or 8 or any number of days. And yet the origin of the week goes so far back into the distant past that it is lost in tradition.

All ancient peoples of which we have any definite knowledge, with the possible exception of some of the later Greeks, were geocentrists. To them the earth was the center of the universe and the greatest of all material things. The sun, moon and stars were put into the heavens only to serve and administer to the needs of the earth and the inhabitants thereof. The earth was supposed to be fixed and immobile, supported on some sort of pedestal, while the heavens revolved around it. This conception of the fixity of the earth has extended into quite modern times, and no doubt, a few people still retain the belief that this is so.

These ancient peoples noticed that the great mass of stars remained at rest relatively to one another, but that a certain small number of heavenly bodies moved independently of each other and

all the rest. These bodies, seven in number, (which can all be seen with the unaided eye) were believed to be the abodes of gods who ruled over the earth, each on successive days. The days were given the names of the gods that went with them. The names of those ancient gods still label the week days of our present calendar.

That is the explanation of the origin of the seven-day week according to the latest and most satisfactory knowledge on the subject. If the ancients had had the use of some sort of telescope and had discovered the presence of the other two planets in our solar system, we may, just as reasonably, have had nine days in our week instead of seven.

At the time of the French Revolution owing to the craze for working the number 10 into everything, an attempt was made to establish a 10-day week. But the authors reckoned without their host. The influences of the church were against it and the people did not want it, so it came to nothing.

With the addition of the week the calendar remained unchanged for hundreds of years. As time went by the astronomers noticed that the length of the year was a little less than the 365¼ days which were formerly established. The small fraction did not mean much each year but over the centuries it had amounted to a number of days. It adds up to 3 days every 400 years. That means that the seasons travelled backward through the calendar a fraction each year, ¾ day each century. From the time of the Julian reform to the year 1550 that had amounted to 11 days. Instead of having the vernal equinox on March 21 where it had been when the Julian calendar was adopted, it now occurred on March 10.

In order to prevent this wandering of the seasons and restore them to their former dates, it was necessary to do two things. First, to make such a correction in the Julian mode as to prevent the excess 3 days every 400 years, and second, to drop out 11 days from the current count of time. These changes were decreed, upon the advice of astronomers, by Pope Gregory XIII, and the calendar so reformed was known as the Gregorian calendar, which is the calendar we are using today. In this calendar the leap year rule for the century years held that

only the century-years where the century-number is divisible by four should be a leap year. Thus 1600 was a leap year, but 1700 was not, nor 1800, nor 1900. The century year 2000 will be a leap year.

These changes came into effect in all Roman Catholic countries in the year 1582. Many other countries refused to accept the new calendar at that time, one of the main objections being animosity toward the Roman Catholic Church and suspicion of anything that originated with that body. Great Brtain did not accept the corrected version until 1752. In that year the British Government ordered that the day following the 2nd of September should be called September 14 so as to bring their calendar into harmony with that of the other countries which were using the Gregorian calendar. Of course, groups of the public exhibited their usual resistance. Mass protest meetings were held demanding: 'Give us back our 12 days!' However, enough people recognized that the change was a step forward so the new calendar remained.

Thus in its slow development through the ages the calendar has had its struggles. Since the dawn of history it has been an institution with man, and anyone who dared to trifle with it risked the wrath of all upholders of tradition and the status quo. It has had to overcome the objections of religious and political pressure groups and the natural reluctance of man to accept change whether or not it is for his own betterment. But in spite of protests, it has progressed. Whenever it failed to meet the operating requirements for which it was designed, it was changed.

As a result we have a calendar today which is almost perfect astronomically. It tells us when the seasons begin and when they end. It sets our holidays, states on what days we should work and on what days we should have feasts and fasts. It regulates the time when we must pay our grocery bills and when our rent becomes due. It sets the dates for all the events of our lives and keeps them rolling around in an orderly and regular manner. In short, it controls the operation of our entire society.

Today, however, a new quantity has entered the picture. That quantity is called 'load factor.' Load factor can be defined as the ratio of the amount of work done

by a piece of equipment in a given time period to the amount of work which could have been done by the same piece of equipment if it had been operating continuously for the same time period. For example, if a certain motor operates intermittently for a total of 6 hours in a 24-hour period, its operating load factor can be said to be 25% for that period. For an operating load factor of 100% it would have to operate continuously for the 24 hours. In the days of the spade, the wooden plow, the home-made clothing, the oxcart and, more recently, the horse and buggy, load factor was not considered to any great degree, if at all. Today it cannot be ignored.

Our population has increased. Our productive equipment has developed and been perfected to such a degree that it is now a closely integrated, high-energy technological mechanism. In order that this mechanism shall serve our increased population efficiently, close attention must be paid to its operating load factor. Low load factor operation means waste of energy, materials and equipment. This in turn is reflected in a lower standard of living for the people. So much has been written on the wasteful, inefficient operation of the politico-business Price System in effect today that we need not elaborate this aspect. What we are concerned with here is how much of this inefficiency is due to the design of our present calendar.

A little reflection makes one realize that our habit of doing certain things on certain days and at certain hours, as regulated by our present calendar, results in traffic jams on our transportation systems, and peak loads on our places of recreation as well as on our industrial equipment. How many of us have tried to get transportation to a pleasure resort on a sunny Sunday afternoon? How many have stood in line in front of a theater on a Saturday night? How many have been stranded over the week-end in some small place where everything closes on Sundays? The examples are so numerous that none of us should have any difficulty recognizing how the habits acquired through regulating our individual and collective lives by the calendar are causing peaks and bottlenecks, hampering the smooth operation of our social mechanism. If we are to improve the load factor of our social operation it is necessary

for these peaks and bottlenecks to be eliminated.

In order to smooth out these irregularities, Technocracy Inc. is proposing a revised calendar which is designed to conform to the technological operating requirements of today's social mechanism. The day and the year are major astronomical periods, the significance of which cannot be ignored. As we have seen, the week and the month no longer have any such significance.

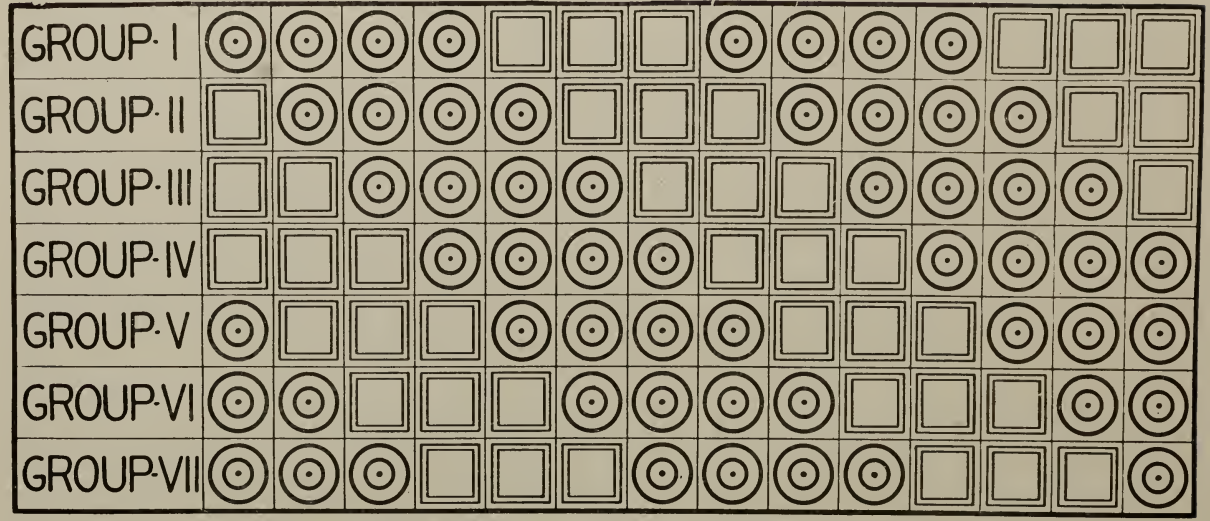
Technocracy's calendar, accordingly, is based on the day and the year. It would consist in numbering the days of the year consecutively, starting with some seasonal beginning, preferably the vernal equinox, from 1 to 364, plus 1 zero day (2 zero days for leap year). The work period would run for 4 consecutive days for each individual, followed by 3 days off. Not taking into consideration the vacation period, every day would be a day off for three-sevenths of the working population—all adults between the ages of 25 and 45.

In the accompanying figure this is shown diagrammatically for 16 consecutive days chosen at random during the year. The working population is divided into 7 groups, each of which has a different sequence of working days and days off. The days of work for each group are indicated by the circular spaces and the days off by the blank squares. A calendar with such a design will eliminate the periods of peak load operations of our transportation systems, recreation facilities and industrial mechanism as exemplified above.

Since all groups will be working under similar conditions, there will be no advantage, from the standpoint of group designation, for a person to work in any one group in preference to another. It will be necessary, however, to make some adjustments, as in the case of a wife and husband who belong to different groups and wish to have their days off on the same days. Such cases are easily managed since the transfer of a person from one group to another will be a mere administrative detail. The size of the groups can be balanced just as easily in the same manner.

With the adoption of this calendar we must not lose sight of another detail which is responsible for many short periods of peak-load operation in our services and industrial organizations.

SECTION 1 - R.D. 12349 TECHNOCRACY INC.



PERPETUAL CALENDAR OF THE AMERICAN TECHNATE.

THIS CALENDAR:

1. WILL EQUALIZE THE NUMBER OF HOURS ON OR OFF DUTY AMONG ALL WORKING PERSONS.
2. WILL PROVIDE MAXIMUM FLEXIBILITY IN ACCOMODATING THE PREFERENCES OF INDIVIDUALS OF THE WORKING POPULATION AS TO WORK-DAYS, REST-DAYS AND VACATION PERIODS.
3. WILL PROVIDE MAXIMUM FLEXIBILITY IN EQUATING THE TOTAL NUMBER OF HOURS WORKED PER PERSON PER YEAR TO THE TOTAL CONSUMPTION REQUIREMENTS OF THE POPULATION.
4. WILL ALLOW BALANCED LOAD OPERATION OF ALL INDUSTRIAL AND SERVICE SEQUENCES FOR ANY GIVEN TIME PERIOD.

THIS CHART IS BASED ON THE TECHNOCRACY STUDY COURSE, LESSON 23

RESEARCH COMMITTEE SECTION 1 - R.D. 12349

This is the matter of shift work. This difficulty has been overcome today to a slight degree in the congested centers of industry by a system of staggered shifts.

With the adoption of the Technocracy calendar, this staggering will be expanded until the load on all our facilities will be as nearly equalized in every hour of the 24 as is possible. To keep all our equipment operating near 100% load factor, each working group will be divided into different shifts. To equalize working conditions for all concerned it will probably be found necessary to rotate each individual in such a manner that an equal amount of time will be spent on each shift during the course of a year. The number of these shifts will depend on the number of hours each individual works per day. Once Technocracy's over-all plan is in full-scale operation there is little doubt that the working day for each individual can be cut to 4 hours per day. On a basis of 660 annual work-hours and a 4-hour daily shift, we arrive at 165 working days, or 41 as the nearest whole number of working days and days off—a total of 287 days. There remain, then, 78 successive days as a yearly vacation period for each individual. (Since the income of an individual in the Technate is not a reward for man-hours of effort, long vacation periods can be granted without any decrease in purchasing power.)

The adoption of the Technocracy calendar would have a tremendous effect on the load factors in our social mechanism. It means that there would be almost the same amount of activity every hour of the day. Each day would be a working day for four-sevenths of the working population and a day off for the remaining three-sevenths. Consequently, centers of recreation would not be deserted, as they are now during the week days, and jammed beyond capacity on holidays and week-ends. Instead, ample recreation facilities could be provided so that at no time would the playgrounds, swimming beaches, parks, theatres or other places of recreation be over-crowded. Transportation jams would also be eliminated.

The Technocracy calendar is a typical example of the social changes that have been made necessary by advancing technology. It is only one detail in the blue-

prints of a scientifically administered society—a Technate—but it demonstrates clearly some of the advantages of installing a new social mechanism of functional control. **—C. A. Norberg**

★ THE CANADIAN CENSUS MONOGRAPH issued in 1937 reported that the age for leaving school in 1911 was 14.38 years while the age for achieving economic independence was 16; in 1931 these ages were 16.25 and 18 years respectively. There was a continuous gap between the age of leaving school and the age when the youth was able to earn enough to support himself. Subsequent reports showed the long-term trend unbroken, and, if the tendency continued unchecked, says the monograph, 'young people will in a few years be dependent on parents at the age of 20.' Loss of independence was entirely among young men, girls having actually gained while young men up to 25 had lost. The social effect which gives point to the need for a new outlook, was seen in the falling marriage rate in the 20 to 24 age group, and in the 100% increase in the illegitimate birth rate from 1921 to 1931. At the time of the 1941 census, only 8% of Canada's young men under 24 were married, and 21% of her young women. —ROYAL BANK OF CANADA

★ EVEN AS THE FIRST OF THE ATOMIC BOMBS crashed down on Japan, the world was hit with the terrible knowledge that Nazi scientists in Germany were within a few months of being the first to successfully harness the terrible destructive powers of uranium. But the bombs which fell in Hiroshima and Nagasaki did not destroy the Nazi scientists who had spent a decade or more in working on the development of atomic power.

The German cartels, who hired and supervised the research of the Nazi atomic scientists, today control more than forty percent of the industrial resources of fascist Spain. Many of the German Nazis who worked on atomic bombs in Nazi Germany are now safe and working in laboratories in Nazi-Falange Spain.

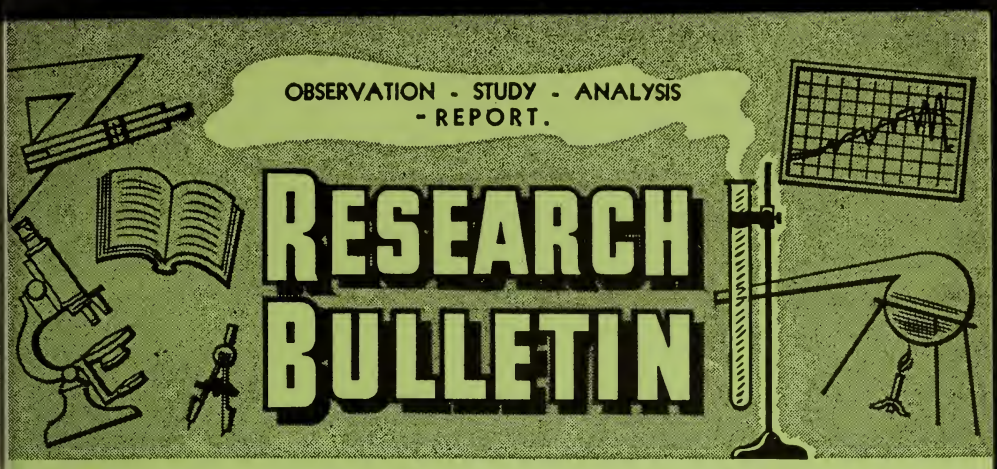
—JOHN M. COFFEE, U.S. MEMBER OF CONGRESS

★ OTTAWA.—Of the eighty Fairmile naval ships built for the Royal Canadian Navy during the war four were delivered to the RCMP with complete equipment as naval vessels for which the Department of Justice was charged $200,000. The War Assets Corporation sold 49 at $3,000 with the exception of one which was sold in a damaged condition to L. Levin for $1500. The average cost of the ships was $140,329 each. —VANCOUVER SUN

★ UNTIL THIS WAR, 1929 was our highwater mark as far as jobs are concerned. That year the number of people working totalled more than 3.7 million. Four years later, in 1933, employment reached a minimum—3.1 million. That meant, allowing for increase in the population, that there were then about 700,000 unemployed in Canada. Actually the situation was worse than this figure indicates because there were thousands employed only part time or in jobs paying semi-starvation wages.

—CANADIAN AFFAIRS

★ FASHION NOTE: On page 12 of the morning *Times* I read again that Britons may expect fewer clothes than ever. On page 3 is a glamorous advertisement of 'Imported Suits from England' of fine Saxony wool. English women will wear trade balances this season. —MARGARET MARSHALL in *The Nation*



FEBRUARY, 1946 Compiled by Editorial Staff No. 37

Canada's Construction Industry

A STRUCTURE is something fixed in position by man. Thus 'construction' is the putting-together of all kinds of stationary man-made objects, including tunnels, quay walls and radio masts, as well as houses.

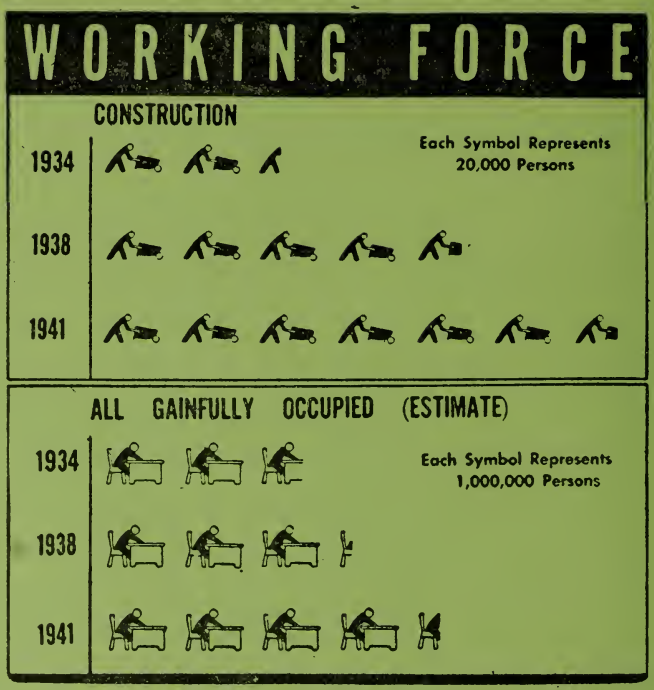
While some building is done by people engaged in other occupations—as when a miner shores up a stope, or a gardener builds a wood shed—most of Canada's building is done by building tradesmen, who spend their working lives moving from one building site to another.

There was a time when **all** the people connected with building worked on the site. Three hundred years ago, when Champlain ordered his 'Habitation' near Port Royal, the whole job was done right there. The workmen prepared all their materials within walking distance of the spot chosen for the building.

The important difference between that house and one built in Nova Scotia in 1945 is not in the general appearance, nor in the primary crafts employed in putting it together. It is only in such assembly details as the wire nails that the basic house of today is very different from its first ancestor in Canada. The big change that has taken place in building since the white man came to America is

that nowadays more than half the preparatory work is done **away from the site.** A whole series of trades are busy preparing the components to be assembled by on-site workers.

The process of building thus involves men on-the-site; men fashioning and supplying materials specifically for building purposes; and men extracting raw materials, some of which will find their way into structures. We can't label all these people as the Construction Force. Some will call themselves workers in transportation or mining. The one group we can count with certainty are those whose jobs are on construction sites.

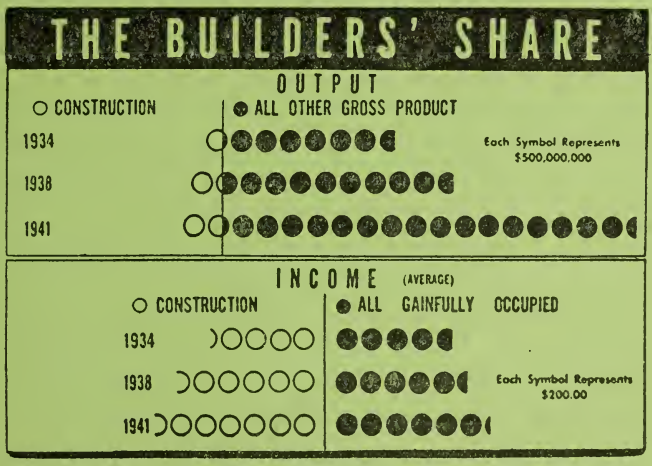


How many jobs on actual building are there in Canada? The Census people say there are 125,000 to 130,000—about one Canadian in every ninety, or about one in every forty of the Canadian working force.

However, there are a good many other Canadians who depend directly on construction for a living, even though they are not members of the Construction Force as we have defined it. The statisticians cannot make a pat answer as to how many people look to building activity for their pay, but they estimate that their strength is at least as great as the R.C.A.F. was at its peak: a little over 200,000.

The size of the Construction Force varies a good deal with the amount of work for it to do. Every year sees rush periods and slack periods, as wet and cold weather prevent many on-site workers from carrying on. In the rush periods, thousands of farmers and others may join the building force. Taking all these things into account, the experts reckon that Canadian construction workers did about 170,000 man-years of work in 1940.

There are several ways of measuring the contribution made to our well being by the construction workers. We can rate their output and wages alongside those in other areas of production. This is estimated for three years—poor, average and peak—in the graph below.



Building craftsmen's incomes are not high, even though they receive fairly good hourly wages. The reason has been that they are unable to earn at all for a good part of almost every year. Time is lost after one job is finished and before the next begins, or because

of the weather. The construction industry also fluctuates from year to year, more than most others. Even in 1929, the average building worker went seven weeks without pay. During the war the builders have enjoyed steadiness of employment almost comparable with that in other occupations.

Within the construction industry there are rigid lines drawn between groups performing different operations. The two major groups of on-the-site workers are those in what is known as **building construction** who enclose space and provide shelter; and those in **engineering construction** who assemble other kinds of structures, such as bridges, roads, harbours, pipelines, cables, railways, and so on. Besides these major groups there are some building workers engaged permanently or for short periods to do minor alterations and maintenance work.

We shall begin with the tradesmen most frequently employed on-site in the building of houses. They are of seven classes: Carpenters, Joiners and Cabinet-makers; Brick-Layers and Stone Masons; Plumbers and Steam-fitters; Electricians and Wiremen; Sheet Metal Workers; Plasterers; and Painters and Decorators.

These are the men to be found wherever buildings of any of the usual kinds are going up. We shall not stop to describe their skills, pay or conditions of work. Those subjects can better be discussed with the (Canadian) Legion's booklet on the **Building Trades** in front of you.

There are a number of other specialists on many larger jobs, who should be mentioned. The men who are skilled in the making of concrete forms; in the placing of reinforcing steel and pouring of concrete; the erection of steel columns, girders and beams; in laying roofing; in the setting of tile; craftsmen with architectural glass and metals; and such new-comers as the installers of air-conditioning systems are among these specialists. All these tradesmen are assisted in their work by apprentices, unskilled and semi-skilled fetch-and-carry men.

For the layman, the most dramatic kind of construction is the large project where derricks, steam shovels, bull-dozers, concrete conveyors and the rest of the industry's heavy artillery go into action. These superhuman power tools burrow in city streets, span wide

ravines, or push tons of steel and concrete aloft with unbelievable power and precision.

In **engineering** construction a revolution has taken place in recent decades. A hundred years ago, the construction of a railway, a road, a canal or a dam called for a huge army of almost unskilled (and very low paid) workers with spade and pick. There are still jobs for many unskilled men in engineering work. But the contractors who specialized in engineering projects have learned to use mechanical power as well. At the present time, some of the highest wages in the construction field are paid to the operators of heavy powered gear.

Estimates for typical buildings show that to keep men busy on the site, there may be twenty men engaged in the fabrication and transport of building supplies.

Some types of building operation require more preparatory work away from the site than others. In asphalt paving the greater part of the labour is done on the spot, in spite of the long distance over which the chief material must be brought. A large public building, on the other hand, may involve twice as much effort off the job as on it.

Bill for average house

(FEDERAL HOUSING ACT 1935-1943)

MATERIALS		LABOUR	
LUMBER	43.8%	CARPENTERS	37.0%
PLUMBING and HEATING	19.5%	PLUMBERS	13.2%
MASONRY	15.1%	PLASTERERS and TILE LAYERS	9.1%
LATH PLASTER and INSULATION	7.3%	MASONS and BRICK LAYERS	7.3%
PAINT and GLASS	5.7%	PAINTERS and GLAZIERS	4.8%
ROOFING	3.7%	ROOFERS and SHEET METAL WORKERS	3.2%
ELECTRICAL EQUIPMENT	3.4%	ELECTRICIANS	2.9%
OTHERS	1.5%	SEMI-SKILLED and UNSKILLED WORKERS	22.5%
	100.0%		100.0%

There has been a greater use of machines in building construction as well as in engineering work. But rather than bring much more machinery to the building site, the tendency has been (in small projects particularly) to work the materials more nearly to their finished state before delivering them for assembly. The ultimate result

of this movement is perhaps the small house made by an aircraft firm in Montreal; the main operations on the site are to unload this house from a trailer, fold on the dotted lines, drop in some bolts and couplings to hold it in shape and bring in water and light.

Some of the advantages in building-in-a-factory are obvious. Not only can more use be made of machine power. Savings in material and transport can also be made. The battle against the housing shortage can go on indoors in rain or shine, throughout the day and the year, instead of coming to a halt while highly skilled men wait for ground or materials to dry out—or thaw out. Whereas the best craftsman can supervise the work on only a few house sites during the working day, in a shop he can check on the details of scores of dwellings in eight hours. The man who adapts himself to the ways of machines can thus work on more jobs in a day—or a year. He can become more productive and get better pay.

Prefabricated buildings erected during the war have for the most part been designed with portability or simplicity in mind, rather than the economical and permanent accommodation of a family. The encouraging thing about wartime prefabrication is this: if we can learn how to gain other ends, can we not in time learn to make decent, low-cost, permanent dwellings too? The answer of the expert is: 'Yes, but it will take a little time and a good deal of initiative.'

—Canadian Affairs, Reconstruction Supplement No. 3

EDITOR'S NOTE: *Technocracy has been publicly advocating the manufacture of prefabricated buildings for over ten years. Today, the mass production of dwellings is the obvious solution to the housing shortage. Governments of Canada and United States, please note!*

Whither Glass?

SIX thousand years ago man, ignorant of the vast and far-reaching results his discovery was to have, first noticed glass. Probably a hard, brilliant substance, caused by a fusion of sand and soda in the ashes of some potter's fire, was the first evidence of this remark-

able material, the romance of which has caught men's fancy and aroused scientists' interest for generations.

Until near the dawn of the Christian era all glass was coloured and hand made with amazing craftsmanship exhibited in each piece of painstakingly formed ware. With the advent of transparent glasses came interest in development of glasses for purposes other than personal adornment. Through the blighting of lands by wars, the art of glass making was lost to one nation to be reborn in another with renewed vigour as the slow growth of the industry spread through all the countries of Europe and finally came to America early in the Seventeenth Century. Glass making has become a science and is now firmly entrenched as a leading industry.

However dimmed by the passage of time the origin of glass may be, its many and varied uses in the home, on the war fronts and in industry, mark this material as one of the most valuable known to man.

Industrial Applications. Few of us realize the thousands of ways in which glass of various types can and does aid our manufacturing both in war and in peace. With a tensile strength of the same order as that of steel and with the most perfect elasticity up to its breaking point, of any known material this super-cooled liquid has established itself as a 'must' in industry the world over.

In laboratories of every kind glass is evidenced. The development of laboratory glassware has helped make possible the great strides that research in all fields has taken in the past or will take in the future. From the simplest test tube to the most intricate accumulation of specially built equipment the products of the glass blower's art are doing work no other material could do. Burettes, pipettes, flasks, fractionating columns and packing, fibrous filters and storage bottles are only a few of the necessaries in every-day chemical laboratory work in which glass plays the leading role.

The very buildings which house bustling industries make use of this fundamental material in a variety of ways. Sunlight is admitted through windows and glass blocks. The glass blocks have the property of being able to transmit light without our seeing through them with clarity and definition. This makes them desirable for such installations

as building walls, inter-office partitions, ornamental windows, etc. Plants and factories are able to work the clock around by the simple expedient of using the little-thought-of incandescent lamp. The development of a glass globe capable of housing a hot filament in a gaseous atmosphere while withstanding atmospheric pressure indefinitely has made this possible. Glass tubing provides a convenient medium for the use of fluorescent lighting.

Glass Fibres. The production and development of glass fibres has increased the usefulness of glass in many ways. Consider for a moment the remarkable properties with which this new form of glass is endowed. The diameter of a fibre or thread—often so small as to be almost invisible—is so thin in relation to its length that great flexibility results. Very high tensile strength is an important physical property as well as its complete non-combustibility and the fact that it is non-absorbent. Acids, with two exceptions, do not attack the fibres in the least degree.

Fibres are made in various sizes depending upon their ultimate use. Interlacing fibres in the form of wool to form thousands of air spaces develops a highly successful building insulation effecting reductions in fuel consumption. The same material properly installed will minimize sound penetration very effectively.

Extremely fine glass fibres pressed with a binder into very thin plates, present very useful retainer mats for storage batteries.

Coarser fibres are used as packing in distilling columns, and scrubbing towers used in various chemical and distilling industries.

Unusually high strength to weight ratios in plastics reinforced with glass fibres are a direct result of wartime research and bodes well for future industrial uses of this material.

Very fine fibres are used as wire covering in electric motors since they withstand higher temperatures than materials heretofore used for this purpose. In high temperature electric motor insulation, glass fibres are used with a heat resisting, impregnating varnish developed in the new field of organo-silicones;—another manifestation of the versatility of glass. The use of this insulator has reduced the amount and size of material need for motors and other electrical equipment.

Glass in this form may be pressed for such uses as instrument

panel board installations and interior partitions on ships. Dictating its use in such places are its properties of fireproofness, vibration absorption and ease of handling. Its buoyancy and waterproofness allow for its providing a highly successful substitute for Kapok in life-belts. Fabrics spun with glass yarn are hung as curtains in offices and plants as an added fire protection. Glass fibres used with a bakelite bonded mat execute the most effective job known as a refrigerator insulation. Air filters fitted with glass wool are efficient in filtering dust laden air prevalent in many plants as a result of manufacturing processes.

Compressed into convenient cylindrical shapes, fibrous glass may be used as steam pipe insulation. Equipped with such thermal acoustical and vibration absorbing properties glass fibres in blanket form are used in numerous installations such as surface of boilers, tanks, and tank cars, sound stacks and on much other process equipment.

A fibre glass cement has been developed as a type of monolithic installation for such applications as require it. Irregular surfaces like pipe fittings provide excellent outlets for this material.

Light weight glass fibres used as a substitute for aluminum in Naval and Army equipment have saved millions of pounds of this valuable metal during World War II.

Medical science has also benefited greatly by the use of this comparatively new material in surgical sutures and dressings. Sponges used in surgery are often threaded with a glass fibre so that they may be easily detected by X-ray if unknowingly left inside a patient's body. The fact that glass thread is harmless to body tissue makes the above usages possible. In filtering blood plasma before it enters the patient's veins, glass fibre has again contributed a valuable tool to the men in white.

Truly, man's search down through the centuries for some type of pliable glass has been fruitfully culminated in the discovery and development of the mighty glass fibre.

For Safety. Few plants today are not equipped with safety devices of numerous types. Glass again plays an important part. Closely controlled compositions and production techniques have made available toughened glass for use in safety goggles which aid in the reduction of industrial casualties. As pointed out above, effective fire prevention

is provided by the liberal use of glass in all its forms. Sheets of low expansion glass protect the 'heat worker', in some operations, from excessive exposure.

Textiles fabricated from glass are used in numerous installations where fire-prevention is an important factor. One important industrial application is the wide use of such fabrics as welding curtains.

Railroad signal lights for some time were difficult to discern through rain, fog, etc. However, careful research resulted in the development of standard easily seen signals and glass again is effectively used in the prevention of numerous accidents.

Optical Glass. Advancements in any field of science would not have been made were it not for the use of glass as optical components in precision instruments. How many of our physics laboratories could function without such a comparatively simple thing as a microscope? Precise measuring devices, telescopes, magnifiers, refractometers are only a few of the instruments so vital in research, so commonly accepted—yet so useless without glass. This glass is made with elaborate technique and rigidly controlled composition to ensure the yield of proper optical and physical properties.

The optical pyrometer that gives us such an accurate and rapid measurement of the temperature of furnaces and kilns is an example of how optical glass may be used in industries of almost every type.

Photographs and microphotographs would be non-existent without the scientific application of accurately ground and polished optics in exacting instruments.

Although far afield from industrial uses it must be recalled that optical glass, in the form of precision instruments such as range-finders, binoculars, dial sights and telescopes, contributed in no small measure to the success of our Army, Navy and Air Forces.

Tubing. The manufacture of glass tubing in many different forms opened up uses for glass that have become essential in modern industry. Capillary tubing, thermometers, laboratory glassware, tubular gauge glasses, oil sight feeds and manometers are only a few of the industrial services in which glass tubes may be used.

Piping of a low expansion glass is used extensively in the food and chemical industries. The heat and chemical resistance of the

piping makes it very desirable for the transportation of hot, corrosive chemicals. The very transparency of glass piping is not the least of its advantages in that it permits of rapid visual inspection of interior pipe walls at all times. Quality control of products is also improved through the elimination of pipe line contamination. Costly and frequent replacements of the previously used metal piping led to wide adoption of glass in pipe installations.

Sanitation in the various food industries proved to be no stumbling block for glass. Its smooth walls maintained by virtue of its corrosion resistance, offers no pits for bacterial growths to start and also permit of no sediment build-up through interference of flow. In addition, the low coefficient of expansion of the glass allows for the frequent flushing of pipe lines with steam, hot water or cleansing agents in sterilizing.

Gas pipe heat exchangers of the jacket type are common. Changes in heat conduction caused by scaling or pitting of metal piping is of course not evidenced with the use of this corrosion-resistant glass.

The development in recent years of electronic welding of glass has made possible the production of jointless tubing which is easily and quickly cleansed. It also eliminates the possibility of leakage of the various corrosive gases or liquids commonly carried in these lines. The reducing or elimination of the number of metal joints present greatly decreases cleaning time since the metal parts are the prime offenders due to their relatively small resistance to corrosion.

The use of glass tubing in cooling coils is also widespread throughout the chemical industries.

'Electrical' Glass. The applications of glass, in its many forms, in the electrical industry appear to be endless. We have only to look around us in any plant to realize the thousands of uses to which the material is put. Glass is prevalent from the lowly fuse shell to the most involved blown-glass shapes for radio work.

Soldering metal fittings to glass has been made possible by the recent technique in metallizing glass so that the metal actually becomes a part of the glass. Resistor jackets and transformer bushings are manifestations of glass fabricated in this manner.

The use of glass in radio tubes is well known but wartime research

has developed many more valuable uses for it in radio work. Glass for these types of installations must meet rigid specifications with respect to its workability and its composition. Its composition must be closely controlled so that a variety of glasses may be produced that will seal with the various metals used and yet have correct electrical and heat resisting properties.

The excellent dielectric and power factor values that glass possesses at high frequencies allows its use in all types of radio installations and standard glass insulators are common.

The eye of radar—the cathode ray tube— is an excellent example of the importance of glass in this highly developed science.

X-ray tubes and heavy lead glass shields to control the rays' path are by now common indications of the necessary jobs that glass performs in bringing to light the previously unknown. The ability to determine quickly and decisively the soundness of castings has proved of inestimable aid in all industries.

Photo-cells with their fundamental glass components daily perform miracles of automatic counting and inspection in all types of industry.

A very recent development in glass is the injection precision moulding of machinable parts. Glass is cold moulded to desired shapes and then machined and fired. The product is a very hard, low expansion, opaque glass easily held to accurate dimensions and used for precise shapes such as cores for electrical windings. Previously all glass parts requiring holes were forced to go through laborious drilling and grinding operations. With this new technique any number of accurately dimensioned holes may be produced in intricately shaped patterns.

Finally, the development of a very thin glass ribbon as a substitute for mica in electronics marks glass as a vitally important electrical tool.

Miscellaneous Industrial Applications. Glass centrifugal pumps during the last few years have been widely applied in industry. All that has been outlined above about the chemical and physical properties of glass to merit use in piping applies equally well in the case of pumps. Strong acids and alkalies are handled with no serious

effect in these pumps. No metal parts are contacted by the circulating liquid. Headplates, volutes and impellers are all made of glass finished to tolerances as close to those used on similar metal parts. A high quality thermal shock resistant glass is used as the rotating member of the ring seal in the stuffing box. Thus there is no fear of breakage when cold water is again circulated through the pump after having allowed it to run dry and develop frictional heat in the stuffing box. As in the case of glass piping cleaning is done by the simple expedient of flushing hot sterilizers through the pump which is entirely constructed of low expansion glass.

Recorders and indicators of all kinds including flow meters, pressure indicators, voltmeters, ammeters, and potentiometers all utilize protecting glass faces.

Viewing ports and sight glasses used on boilers, evaporators and water tanks all symbolize the indispensability of glass in the manufacture of any article. Such common usages of glass are not indicative of the amount of research and general engineering necessary to produce a product capable of performing these duties. Wherever visual observation is necessary in a processing operation it is up to the glass designer to produce an article equal to the task. In some cases the glass is required to withstand only a severe thermal shock, in others, pressure and corrosion are the main stumbling blocks to be overcome. Either with varied composition or a change of form, glass measures up to the job and successfully fulfills its apparently simple duty.

It will stand temperature up to 1700 degrees fahrenheit and is corrosion resistant. With these properties it has made useful crucible material for research using temperatures and chemicals that would destroy other known materials. It has also another interesting application in its use as a transparent thermocouple protection tube, shielding the delicate couple wires from the corrosive effect of the hot furnace gases.

During the war while metal was scarce, glass was used in the machine shop in the form of snap, plug, and ring gauges. Several advantages in using glass for gauges are seen in its hardness and abrasion resistance. Owing to its low expansion and low thermal

conductivity change of temperature occasioned by handling have little or no effect but are still in the embryonic stage in so far as industrial uses are concerned.

Glass rollers are being supplied to various industries in which smoothness and precision finished faces are important as well as corrosion resistance.

In precision electrical instruments the steel pivot bearings formerly using sapphire jewels now are being successfully made from glass. The composition for such a glass must yield a product of considerable impact, abrasion and crushing resistance since the small steel pivot transmits extremely high pressure to the jewel.

Ridiculous though it may seem at first thought, glass is used in coil springs of light loadings. Often such springs are designed for use in acidic atmospheres where the resistance to acid attack offered by glass makes it a desirable spring material. The extreme elasticity of glass retained over a wide temperature range also makes it an ideal coil spring for certain uses where heavy loading is not necessary. Under tests glass springs have exhibited an amazing reluctance to fatigue after millions of deflections.

Probably few of our advancements in medical science could have been made without the use of hard, chemically resistant glass as equipment and bottles in which to store such amazing discoveries as insulin and penicillin.

Conclusion. The foregoing article has dealt with some of the many industrial uses to which glass has been put but let us not forget the domestic applications in millions of homes across the nation. Pressed and blown Pyrex glassware meeting stringent specifications with respect to physical properties makes the task of cooking and preparing meals for the hungry worker a brighter and more cheerful chore.

Indeed, glass has come a long way since its initial discovery and as our knowledge of its peculiar properties increases new uses will be found and glass will continue to aid our production, brighten our lives and excite our exploring minds.

—B. L. Matthews in Manufacturing and Industrial Engineering

Petroleum Research

PLANS for two major petroleum research centers, construction of which will be started as quickly as steel and other materials are made available are under way and will be completed late in 1946 or early 1947 by the Standard Oil Company (N.J.).

The program will provide scientists of Standard Oil Development Company, central organization of the Jersey Standard group, with modern and extensive research facilities in the oil industry.

'The effectiveness of scientific research in protecting and raising the people's living standards and in opening new realms for human endeavor is one of the outstanding facts of our day,' Mr. Holman, President of Standard Oil said. 'Free people everywhere have particular cause at this time to be grateful for the research carried out in the laboratories of our country during the past decades. From that research came the weapons that saved us from disaster and made possible the victory we are now thankfully celebrating.

'The United States, which contributed so much to the war, can contribute much to the building of peace. To do so effectively will call for continued scientific achievement. Reconstruction, and the creation for conditions in which people can find security and satisfaction depend to a large degree on the energy devoted to research.'

The new centers will be at Linden, N.J., and at Baton Rouge, La., at both of which places Standard Oil Development Company already has large laboratories. The expansion program ultimately may involve the expenditure of $8,000,000. At the outset eight buildings containing a total of 350,000 square feet of space will be erected there in a landscaped area of 60 acres, and one building containing 35,000 square feet will be put up at Baton Rouge. Applications filed with the War Production Board for a major portion of the project have been approved. Construction work alone is expected to provide 1,800,000 manhours of employment. Broken down into days, this means 225,000 eight-hour work days.

To help staff the new facilities, an increase of at least 20 percent in the present research and technical group of 2,100 will be necessary.

Adding to Mr. Holman's announcement, R. P. Russell, president of Standard Oil Development Company, said the new laboratories would be used not only for developing improved products from oil and processes for producing them but in addition extensive work on extending sources of supply of oil products would be carried out. That latter work will include production of liquid hydro-carbons from natural gas, gasification of coal, oil from coal and production of oil from other carbonaceous deposits such as oil shale.

Basic studies will also be conducted on the application of catalytic processes to derive chemical raw materials from petroleum. One section of the new structures will be devoted to research on extremely low temperature polymerization, important in the field of new plastics. A process of this nature is the basis of Butyl rubber, a synthetic developed by Jersey Standard and superior to natural rubber for inner tubes and for certain other purposes. Discovered prior to Pearl Harbor and perfected during the war, the entire output has gone to military needs.

In addition, Mr. Russell said the company will expand its investigations in various aspects of the science of physics. Having had a part in the earlier work on the atomic bomb, it plans to keep abreast of developments involving use of atomic energy.

'We believe that these great research facilities can be an important factor in producing fuels, lubricants and production of chemicals from oil and gas,' Mr. Russell stated. 'All work will be made available to the entire industry in accord with the policy we have followed for many years.

'Everyone knows the mighty job the oil industry performed during the war in the perfection of high octane aviation gasoline, synthetic rubber, synthetic toulene for TNT and such weapons as the jellied gasoline fire bombs, flame-throwers and the smoke generator.

'Our organization hopes now to do a similar job in scientific research for peacetime products. Our new laboratories are a major step in the direction of keeping ahead in industrial research.'

—Commercial Aviation

Witchcraft in Economics

Half our ills in modern times, from mass unemployment to total war, can be attributed not to science but to our apparent determination to confine it to a few matters while in others we continue with the old methods of learning . . . —Professor A. M. Low

MANKIND is undergoing a vast change, the kind of change that happens only once in ten thousand years.

It is a change due to the spread of a scientific method of thinking only now making itself felt in every country and every class.

Not many people to-day realize that they are living in an age which is 'epoch-making'—even if considered in the terms of history covering thousands of years.

And surprisingly few grasp just what it is that has given man this vast new power; so great that he need no longer set any limit to his achievements.

They say, perhaps, that it is 'science' that has so altered conditions during the last hundred years, and which promises still more in the next century. And there are people who are grudging about 'science' because it has brought us not only food, clothing, and houses in plenty but bombers, tanks, and death in a hundred forms.

I have put science in inverted commas because it has become one of the most abused words in our language.

You will find it used, quite unconsciously, in at least three different senses in a single sentence. And it is extremely important that we should understand what science—a method of obtaining knowledge—means and implies.

Half our ills in modern times, from mass unemployment to total war, can be attributed not to science but to our apparent determination to confine it to a few matters while in others we continue with the old methods of learning—references to authority, thinking, logic and even feeling.

We are faced by the astonishing spectacle of a world which has discovered methods of harnessing power equipment to countless millions of human slaves and horses, using it for the destruction of life and buildings and men, knowing how to produce every

kind of thing from bread to motor-cars, and quite unable to devise a means of distributing them so all have enough.

It arises from the curious fact that it is only in the field of what I may call mechanics that we prefer science to 'thobbery.'

Thobbery is a word coined out of 'thought-opinion-belief,' the sequence by which much so-called knowledge is obtained.

In the world of science we have attained supremacy not by thinking, holding opinions and believing, but by complete submission to facts.

The scientist knows only one way of finding whether his ideas are right or wrong—submitting them to experiment.

If there is no test or experiment that can be applied, it is almost impossible to distinguish right from wrong.

This has been called the removal of intellectual pride, and the truth is that we have done it only in a very limited sphere of life.

The result has been an enormous expansion in one direction whereas our philosophy, ethics, society—all that is concerned with making use of the material gains—continues to rely upon a mode of thought long since abandoned in mechanics, physiology, and other spheres of fact.

This dividing line is admirably demonstrated by our attitude towards the ancient philosophers.

Aristotle believed that a fly had eight legs. I say 'believed.' He stated it as a fact.

It never occurred to him—or anyone else for about 12 centuries—to catch a fly and count its legs. Eight legs were 'logical.'

Plato's natural history was equally fantastic. No one would dream to-day of quoting these two philosophers as 'authorities' on flies or animals. But they are always being cited as experts on politics, philosophy, sociology, and even economics!

The whole point that we have thrown over logic and authority only in 'scientific' matters and not in all our affairs is thus admirably exemplified.

We may be startled at the 'stupidity' of those who condemned Galileo for asserting that the earth was not the centre of the the universe. But logic was entirely on the side of those who condemned him.

If we wish to know whether a certain type of steel is good enough for bridge building we refer it to experts. They exam-

ine it under the microscrope, x-ray it, test it to destruction, and learn its properties.

Then they measure just what strains the bridge would have to bear, and it becomes plain whether the steel will or will not serve.

But if we want to know whether 'Capitalism' or 'Socialism' is best, or whether family allowances will raise the birth-rate, or how any other social, economic or ethical problem can be solved, what do we do? We elect or appoint experts who debate the matter!

Can you imagine a group of scientists trying to find out by talking?

The reason why science progresses while other forms of thought lie dormant is that technicians do not discuss questions such as 'Are spiders better than beetles?' or 'Is gold more atomic than silver?'

Yet you can produce any copy of a debate on politics or economics—or almost any text-book—and I will show you a dozen statements on a par with these absurdities!

The most superficial glance over the world shows that we are failing to make use of modern discovery.

Should we honestly desire to prepare ourselves for a new civilization we have simply to concern ourselves with things as they are and not with principles, to recognize the supremacy of facts as have scientists in the limited field they have tackled.

So long as it remains impossible to cure prejudice by observation we must expect to see our sociological problems dealt with by methods which savour of witchcraft. **—Professor A. M. Low**

EDITOR'S NOTE: *Professor Low, a British scientist, is the inventor of bifocal lenses used for both long and short sight, and the contact, the invisible lens which fits over the eyeball. He has recently invented unbreakable glasses which can be trodden on, dropped or bent without being damaged; these are made from one piece of fine wire with the tiny half-moon lenses set just below the line of vision and weigh less than half an ounce.*

★ BUSINESS IS NOW ENTERING a primary postwar depression. We do not easily think of present conditions as constituting depression, because there are still many evidences of material prosperity. Nevertheless we are technically entering depression, because unemployment is increasing, production is declining, and national income is falling. —CLEVELAND TRUST COMPANY BUSINESS BULLETIN

The New Energy

The following is condensed from an address delivered by Stuart Chase to a forum on The Challenge of the Atomic Bomb *sponsored by the Nation Associates in New York on December* 1, 2 *and* 3, 1945.

LET us take a speculative look at some of the peacetime effects of splitting the atom. As we do so, we will not forget the warning of Dr. Harold C. Urey, who helped to split it: 'The peacetime applications of atomic energy are of no importance whatever unless the danger of atomic bombs is banished from the earth.'

Thorstein Veblen in his grave must now be permitting himself a sardonic smile.. His technicians and scientists have come roaring into their own as the acknowledged and undisputed arbiters of human destiny. He traced the trend in a series of books a generation ago, but few paid much attention. The philosophers were off in other pastures. Now the trend has culminated in a self-generating flood of neutrons which can blow up the world. For the first time, scientists are developing a social conscience and even daring to dispute the generals and politicians. Veblen used to dream of a governing council of technicians. If the politicians do not look alive, it might come to that. They look pretty dead in Congress now.

Energy is a determiner of civilization. Low-energy cultures absorb most of their manpower in getting food. High-energy cultures such as the United States, or Western Europe, in recent years, can release more than half their manpower for the service trades, education and the arts. The atom may release 90% for higher things—if enough higher things can be found. Not 10% will be needed for farming, mining and manufacturing. Even before the war, learned committees were worrying about the problem of leisure. Presently they are going to have a superlative opportunity to worry!

Dr. A. H. Compton sees the first use in large central power plants, and most scientists agree with him. A reasonably efficient plant, using superheated steam for driving a turbine, could be put

in operation within a year, he says. But costs at first would be high. The generating heat unit will be a pile weighing not less than 50 tons. This dissipates, for the present at least, those bright dreams of lump-of-sugar prime movers, to drive a plane from Chicago to Shanghai.

A pound of uranium now costs $3, about the same as a ton of coal. But it can deliver as much energy as 1,000 tons of coal under present firing methods. This is the comfortable margin atomic energy has to work on. Dr. Compton expects many big central plants within 10 years, especially in areas where power is now expensive. China and India come to mind as candidates for rapid industrialization. These plants will be easy to operate without smoke or fumes of any kind. Lethal rays must be carefully controlled, but safety methods have already been worked out at Oak Ridge and Hanford.

Atomic energy can be used as a heat for making bricks, cement, ceramics and glass. It can be used for smelting metals. Dr. Langer of the California Institute of Technology has suggested that iron might be smelted in the ore bed. Others have suggested that highways in certain areas might be built and surfaced by fusing the ground to lava—as happened under the bomb in New Mexico.

The new energy can work wonders in providing both cheap heat and cheap power for the host of synthetics and plastics which are already revolutionizing industry. The virtue of a plastic from the manufacturing point of view is that it can be molded to unvarying form, and run through the assembly line without the grinding and chipping and shaping needed for natural products, like lumber, stone and metal. Lavish production of plastics is bound to bring a vast increase in economic self-sufficiency. Synthetic rubber, nylon and vinyl esters are just the beginning.

Controlled neutrons have a great many medical applications, such as the irradiation of deep cancers, the tracing of physiological processes by tagged atoms. They can make the dream of the alchemists—the transmutation of elements—a commonplace. We could perhaps change all our lead to gold—if we were that foolish. Atomic energy can air-condition cities in the tropics, and warm up polar housing for the comfort of man. By the electrification

of soils and other innovations, it might change the whole crop pattern.

This outline is only a bare summary of uses now being suggested, but it is enough to indicate a shattering impact on the structure of business-as-usual. The mining of coal will be hit hard, petroleum only less hard. John L. Lewis can be expected to issue a papal ban against nuclear physics any day now. The steel industry, and metals generally, may be turned upside down. Railroad and steamship lines may lose up to 40% of their freight revenue. Technological unemployment could grow to catastrophic proportions, if everything is left to God and the National Association of Manufacturers, to use Alvin Johnson's phrase.

If we try to go on operating some such economic system as we had before 1930, it does not take an especially discerning eye to see that atomic energy will soon break it to pieces. We have here an economic bomb of great explosive power. No nation, except the United States, has any apparent intention of continuing its prewar economic system. Other states may be expected to nationalize atomic power, easing it into the economic structure under carefully controlled conditions, with regard for both the human beings and the industries made obsolete. It will be a large and complicated operation.

Can the United States avoid a similar course? Professor Hayek's disciples will vigorously protest, but how can any community endure the million to one shock of this new energy without planning for it? On the practical level, how could a widely disorganized America hope to compete with other powers when they had organized the flow of neutrons?

Before the war no industrial country devoted as much as 1% of its national income to scientific research. This ratio is now destined to leap upward. J. D. Bernal thinks it may go as high as 20%. Not only research, but education and training on all levels, on a scale hitherto undreamed of, are an absolute must for survival in the atomic age. **—Stuart Chase**

QUESTION: William E. Laurence of the New York *Times*, who observed the effects of the atomic bomb in New Mexico and over Nagasaki, stated recently, 'Atomic energy is here to stay; the question is whether we are.' —THE NATION

Final Report on War Production

The following is the statement made by the Hon. C. D. Howe in the House of Commons on November 19, 1945, summarizing the achievements of Canada in war production and giving the final figures on production from September 10, 1939 to August 15, 1945.

IN EACH annual report to Parliament on the activities of the Department of Munitions and Supply, I have given a statement of our production record under general programme headings, contrasting production for the current year with production in the previous year, and giving total figures of production from the beginning of the war. As this is the final report of the Department of Munitions and Supply, I think it will be of interest to the Committee to have the final figures on production for the period from September 10, 1939 (the beginning of the war), to V-J day, August 15, 1945, the day on which hostilities in the Pacific ceased.

The total dollar commitment for the Department of Munitions and Supply and its predecessor agencies, the Defence Purchasing Commission and the War Supply Board, is approximately $12,751,000,000. This figure includes in addition to the total dollar value of production contracts awarded, expenditures for expansion of industrial capacity aggregating $722,000,000, value of orders placed abroad totalling $1,001,000,000, contracts for defence construction and housing projects approximating $528,000,000 in value, and several other smaller items such as inspection and freight costs.

The net total dollar value of production contracts awarded is approximately $10,500,000,000. I shall not burden the Committee with a detailed description of our production accomplishments, but in this final report, I should like to place on **Hansard** the round figures of production in each of the various programmes.

We have produced 16,200 aircraft of all types from small trainers to large four-engine bombers. Our production of heavy field and naval guns to V-J day totalled 28,000, and in addition to the guns, we have turned out thousands of barrels and forgings. Our production of rifles and machine guns at the

close of the war was 1,500,000. In addition to the gun programmes, we produced 100,000,000 filled rounds of heavy ammunition, about 60,000,000 units of empty shells and cartridge cases, 4,400,000,000 rounds of small arms ammunition and more than 2,000,000 tons of chemicals and explosives. Our output of automotive and armoured fighting vehicles totals 800,000. Our shipyards produced more than 8,000 ships of all kinds, and approximately 1,000 of these were major merchant and naval units. The signals and communications industry has produced instruments and equipment valued at more than $550,000,000. The total value of construction projects undertaken by the department was $777,000,000. This includes defence projects and housing. The general purchasing division of the department, which was responsible for the purchase of clothing, food, fuel and a wide variety of personal equipment had purchases to the value of $3,600,000,000 at V-J day. I might also make mention here of our remarkable accomplishments in the research field and especially of the part we have played in the development of the atomic bomb.

In my remarks on the Speech from the Throne, I had occasion to comment on Canada's dependency on export markets. In this connection, a breakdown by percentages of deliveries of war materials produced in Canada is most significant:

	Per cent
To Canada	34
To United Kingdom and other Empire countries	53
To United States	12
To other united nations countries	1

The impact of the demands of war has brought about a tremendous expansion of industry in Canada. Approximately 60% of all production in Canada during the past six years was for war uses, and as will be seen from the percentages I have just given, slightly less than 70% of all war production was for export. In addition to the private investment in war production facilities estimated at $500,000,000, the Department of Munitions and Supply has invested approximately $720,000,000 in land, plant and equipment. Almost $500,000,000 of this represents investment in new war plants wholly owned by the crown. The plant expansion

programme has been complete for some time. Expenditures made since January, 1945, have been made mainly for the purpose of maintaining and repairing buildings and equipment already in use.

A quick glance at the wartime development of several of our basic industries gives some indication of the magnitude of Canada's industrial expansion during the past six years. In 1944, the effective capacity of pig iron production was 1,800,000 tons, compared with 800,000 tons in 1935. The peak wartime production of ingots and castings was 3,000,000 tons annually compared with a pre-war annual production of 1,600,000 tons. There has been an increase in manufacturing capacity in iron and steel products of all kinds of 166%. Production of non-ferrous metals was about 1,300,000 tons annually at the wartime peak, which is nearly three times the pre-war annual production. The most significant increases have occurred in the production of aluminum, fabricated brass and nickel. Magnesium and mercury, previously imported into Canada, have been produced at an annual rate of about 5,000 tons and 10,000 tons respectively. The number of board feet of lumber produced in 1939 was 3,900,000,000 against 4,900,000,000 at the wartime peak. This increase was achieved despite severe labour shortages. The increase in the manufacturing of chemicals and allied products is estimated at 233%. One of the most noteworthy achievements in this field has been the development of a highly successful synthetic rubber industry. Synthetic rubber is now being delivered from the government-owned plant to commercial markets at a rate in excess of 40,000 tons a year. The expansion of industrial capacity and particularly the production of aluminum to meet war requirements, has resulted in an expansion of the installed capacity of central stations from 7.5 million horse-power in 1939 to 9.6 million horse-power today.

This unprecedented expansion of productive capacity has resulted in manufacturing becoming the leading industry of the country, and what is perhaps more significant Canadian manufacturing for the first time has been placed on a production rather than on an assembly basis. Products hitherto partly or wholly imported, or never produced at all, have been

made in Canada. These include automobile, ship and aircraft components, radio and radar equipment, machine tools and many other items of industrial equipment. At peak production, there were 1,186,000 employed in direct and indirect war industry, or one in every twelve persons of our population. **—Hon. C. D. Howe**

★ CANADA IS THE WORLD'S foremost producer of nickel, asbestos, platinum, radium, and newsprint paper. She is second in aluminum, wood-pulp, and hydro-electric power. She is now second only to the United States in building cargo ships. She is third in producing copper, lead, and zinc. Since the war began she has increased her output of aluminum by over 500%, pig iron and steel by 98%, pulpwood by 33%, hydro power by 23%, and coal by 13%. —Dominion Bureau of Statistics

★ THE RECORD OF LABOR PRODUCTIVITY in wartime is especially dramatic. In munitions manufacturing, aircraft construction, shipbuilding and many other strategic war industries, per-hour productivity of each worker often doubled and trebled. In all munitions manufacturing industries, taken together, a clear indication of the progress made is the notable fact that between 1942 and December 1944, the volume of war output increased 112% or more than doubled, while the number of workers employed to turn out this volume increased only 17%. In this short period productivity per man per hour in these munitions manufacturing industries rose over 72%. —William Green in *American Federationist*

★ IN THE UNITED STATES it cannot be doubted that the material elements necessary for a state of prosperity, including natural resources, labor and industrial capacity, are present in abundance. The country has suffered no destruction or loss of its means of production during the war, but on the contrary probably has had an increase, assuming that the addition of war plants and machinery which can be accepted for peacetime use has more than offset depreciation of old plants and machinery. In shipping, the net gain is enormous. Immense technological progress has added to our productive power. —National City Bank of New York

★ OUR PRESENT CIVILIZATION is dependent upon energy. The extent to which we use energy is one of the indices of the state of advancement of our civilization. We have been lax in the task of distributing justly the benefits accruing from the increased use of energy, and as a result our economic structure is under a variety of stresses and strains. The greater the extent to which we use energy the faster is the tempo of our civilization. This will undoubtedly be true of the era of atomic power which is now dawning. We should therefore make all necessary adjustments to put our economic structure on the soundest possible basis
—John J. O'Neill in *Harper's Magazine*

★ ONE OF OUR CLIENTS says in print: 'Industrial progress is assured by research. Without it the great accomplishments of the past decade would never have been realized. Research enabled industry to meet all the varied demands of war, and at the same time to develop products that will materially contribute to the post-war development and progress. Research establishes fundamental data for the solution of immediate industrial problems. It creates new materials that aid economic and social progress . . .' —Chemical Digest

Facts About Plastics

John Jones, the inquisitive coal dealer (see 'Men and Molecules,' Technocracy Digest, July, 1945) seeks authoritative information on plastics, the most talked of but perhaps the least understood group of modern industrial chemical products.

NO ONE could mistake the way John Jones felt about his son.

Pride shone in his eyes and lent a subtle quality to his voice when he spoke of the bronzed young man who soon would be doffing battle dress after four years of service in the Army.

Jones was looking across the desk in the general direction of The Chemist, but his thoughts were far away. His words came out casually, almost as though he were talking to himself.

'He's a good boy, that son of mine,' he was saying. 'Why, he seemed only a lad when he joined up, just fresh out of high school and all that, but he will be coming back a man in every sense of the term. Thank God he has come through without a scratch, although he has been in the thick of things in Italy, France and the Low Countries. If I know young Tom, he earned those three pips on his shoulders the hard way. The least I can do to show him how proud and grateful I am is to make certain he gets a proper start when he returns to civilian life.'

The thought seemed to shatter his reverie. He fumbled for a cigarette before continuing.

'That's why I came to you,' he told The Chemist. 'I needed some information and advice. Young Tom has said in several of his letters that he would like to get into the plastics business when he comes back. You see, he has run into countless uses of plastics in war equipment, and he thinks the industry has a great future ahead of it. I can tell you that from what I have read and seen myself, I share his opinion. The industry is only in its infancy. Do you think I would be wise to invest what money I have and help my son to get in on the ground floor, before the plastics industry is overcrowded?'

The question was a poser for

Reprinted from C-I-L Oval.

The Chemist and he did not hasten to reply. He flicked a bit of fluff from the shoulder of his grey tweeds and his fingers brushed lightly across a bronze service button in his lapel.

'Your question takes me back to my own discharge from the C.E.F. in 1919,' The Chemist said at last. 'I guess I was up against just about the same problem your son faces today.

'I had enlisted in 1916 with two years of my university course behind me, and all through the war I stuck to my determination to finish my education when the fighting was ended. It wasn't easy to settle down to my studies after the free and easy army life, but I managed to earn my degree.

'I can tell you I did a lot of worrying in that last year at university. What was I going to do after graduation? How could I decide upon the field in which to apply my hard-won knowledge?

'I read everything I could find about the newest developments in chemistry, and it seemed that every book, every article, pointed to the new plastics industry. Here, I thought, was a baby industry which would offer great opportunities to young and aggressive chemists. I went to see one of the few men who was regarded as being outstanding in the plastics business in Canada at that time, and sought his advice.'

Jones almost leaped from his chair. 'But,' he sputtered, 'I thought plastics were something brand new. And here you tell me there was an established plastics business in Canada almost 25 years ago.'

'I can understand your astonishment,' The Chemist chuckled, 'for that is exactly how I felt when I went to see the plastics man. Of course I had known that plastic articles had been on the market for a long time, and were being fabricated in Canada, but I still had the idea in my head—like yourself—that the plastics business was in its infancy. It brought me up short when my host told me in a kindly way that a business that had been running for half a century could scarcely be considered as a babe in arms, even if it hadn't attained more than lusty youth.

'I was reminded that celluloid, the daddy of all commercial plastics, had first been prepared by Alexander Parkes, an English chemist, as early as 1865 and had been available in commercial quantities and at comparatively

low cost since 1870, when a Newark (N.J.) printer, named John Hyatt, patented an improved method of manufacture.'

Jones smiled with relief. 'Oh, but you are talking about celluloid,' he said, with an almost reminiscent sigh. 'Celluloid was great stuff in its day. I can remember my first celluloid collar, and the imitation ivory brush and comb set I bought for Tom's mother the year before we were married. But, of course, what I am talking about now is not celluloid, but the wonderful new plastics we read about every day.'

It was The Chemist's turn to smile. 'Yes,' he agreed, 'there are many wonderful new plastics, but you may be startled to learn that celluloid, basically the same as that which went into your collar and your brush and comb set, still is one of the most versatile and most widely used plastics. With all the progress of the past 75 years, members of the celluloid family—we chemists know them as cellulose nitrate plastics — still manage to hold their own.'

When Jones had absorbed the shock of that remark, The Chemist went on with his personal story. His pipe had gone out and he was rubbing the bowl against the side of his nose as he always did when in a reflective mood.

'I can remember every detail of my visit to the man who was regarded as an authority on plastics in those days,' he reminisced. 'I can see the dingy little office, with its piles of ledgers, and the funny-looking typewriter the stenographer was using. The company only employed about 100 persons, and there was only one telephone to serve the entire staff, but I cannot recall that it rang even once during the hour I was there. Business was a more leisurely affair in those days than now.

'The head of the business was a kindly fellow, a bit on the stout side, and he sat there toying with his watch chain as he talked. He noticed me staring at an exquisitely carved miniature elephant he wore as a watch fob. "That," he told me, "was the first finished piece turned out in this plant when we opened back in 1910. One of our men carved a dozen or so from celluloid as souvenirs of the occasion."

'Anyway,' The Chemist went on, 'my old friend gave me sound and useful advice. He told me that in some respects I had not been far wrong in regarding the plastics

industry as being in its infancy. I can remember how he put it: "Every industry is in its infancy, and I don't care how long it has existed. Certainly no industry is so old that it has been squeezed dry of opportunities for young and vigorous men, men of courage and foresight and imagination who refuse to admit there are limits upon progress and expansion. No matter what development there is in the plastics industry in the next 25 or 50 years, the surface will have barely been scratched. Sometimes we think we have gone as far in our plant as anyone ever will go, in the way of devising new products and new methods of production, but every time some one has come along with a fresh idea that knocks such beliefs into a cocked hat. Why the plastics manufacturers of 1950 will laugh at us pioneers (and he chuckled when he called himself a pioneer) because their products and processes will be miles ahead of ours."

'When you ask me to advise you concerning your son's future in the plastics business,' The Chemist told John Jones, 'I can do no more than tell you this story of my own experience. My first job grew out of that conversation. I have seen the plastics industry grow and prosper, and I know enough about coming developments to endorse the opinion of my friend of 25 years ago, who said that the surface has just been scratched.'

Jones snuffed out a cigarette that had burned dangerously close to his finger-tips. 'I guess we would be about 75 years too late to get in on the ground floor,' he remarked, 'but we might still make a go of it.'

'Certainly,' The Chemist agreed. 'There is no reason why you should look upon the plastics business in any different light than you would any other manufacturing enterprise of similar proportions or complexity. Knowledge and experience are invaluable assets to a man going into plastics, as they would be to a man embarking upon the manufacture of watches, radio receivers, farm implements or rare cheeses. Your success would depend upon exactly the same factors, and you and your son would be up against the same problems and the same risks.'

Jones stuck out his chest a bit. 'Well, I've been in the coal business for 30 years and have managed to keep on the right side of

the ledger,' he asserted. 'I wouldn't be afraid of the business side of it, but the technical side might bother us a bit.'

'Then, first of all, you would have to make up your mind whether you wanted to be a plastics manufacturer, or a plastics moulder or fabricator,' The Chemist explained. 'You see, the plastics manufacturer produces the raw materials, and the moulder or frabricator makes up the finished article.'

Jones was full of assurance. 'I had thought of doing both ends of it,' he admitted. 'I've been reading about how chemists can make plastics from soy beans and from sawdust. Now, out where I come from, we grow a lot of soy beans, and there are several lumber mills not too far away from which we could get all the sawdust we could use. I've been thinking of a small plant to convert soy beans or sawdust or something like that into plastics, and making the stuff up into ash trays, tumblers, toys and gadgets. That shouldn't be such an expensive undertaking, should it?'

The Chemist recalled a long conversation he had had with Jones on a previous occasion.

'Do you remember how we talked of the common misconception that the making of nylon is a simple matter of whipping up coal, water and air in a bowl, like mayonnaise?' he asked. 'And remember what I told you of the ten years of research and the $10,000,000 expenditure which preceded the introduction of nylon on the commercial market, and of the giant high pressure synthesis equipment necessary to produce it from the basic derivatives of coal, water and air?

'Although there have been few, if any, instances in which an equal expenditure of time and money has been involved, much the same story lies behind almost all of the plastics derived from synthetic organic materials, as well as many of those made from such natural materials as cellulose and proteins. As a matter of fact, the development work and investment necessary for the production of plastic materials required by the fabricators or moulders, is generally too high to make Canadian manufacture economical.'

Jones began to have vague doubts about his original plan. 'I must admit that I am a bit puzzled,' he said. 'It all seems so simple and clear-cut when you read about plastics in the Sunday

weeklies and the magazines, but I can see there is a lot I don't know. Would you mind telling me about plastics generally . . . keeping away from the ten-dollar words?'

The Chemist already was thumbing through a dictionary. He passed the book to his visitor, indicating a definition with his finger. Jones read:

> PLASTIC(S) (n) — Literally, anything that is mouldable. Specifically, any of a large group of natural and synthetic organic materials, derived from cellulose, proteins, hydrocarbons or resins, which are moulded (under heat and pressure), extruded, cast or fabricated into various shapes.

'You might take a lump of fresh bread and knead it between your fingers to any shape you desire,' The Chemist said, when Jones had finished reading. 'You can mould candle wax, soap or cheese. But none of these would be practical as commercial plastics, because they lack durability, appearance, insulating qualities, finish, and any one of a hundred other characteristics which the commercial plastic must possess.'

(Continued next month)

★ STATE COLLEGE, Pa.—One of the nation's top chemists sees a scientifically created world of plenty coming. Dr. Frank C. Whitmore, dean of Pennsylvania State College's school of chemistry and physics, is the winner of the Willard Gibbs medal, the country's top chemical award. Dean Whitmore feels confident man can supply his material needs through scientific creation rather than by depriving others. For proof, he points to the advances and developments in chemical synthetics in the last quarter century. 'We must never again try to achieve prosperity by raising prices and restricting output.' —British United Press

★ A MACHINE equipped to cut the thickest brush and young timber up to 18 inches in diameter on the farm lands of the province has been designed and built in Moose Jaw by Messrs. Wiens and Stevenson after 30 years of experience with various types of brush cutting equipment.

The machine which has just been completed is being shipped to the Tisdale district, where its capabilities and unusual strength will undergo practical and extended tests. The designers claim that their machine can more than equal the work of 50 experienced bushmen.

The motive power of the new model is a 60 h.p. caterpillar tractor and the blades which make short work of brush and young trees are made of carbon steel. The new invention is, in large part, the product of local machine shops where all welding and other requirements were carried out in accordance with the drawings of the joint designers. —Moose Jaw Times

TECHNOCRACY

WHAT?

Technocracy is science in the social field. *Encyclopedia Americana* says: 'Whatever the future of Technocracy, one must fairly say that it is the only program of social and economic reconstruction which is in complete intellectual and technical accord with the age in which we live.'

WHEN?

Technocracy originated in the winter of 1918-1919 when Howard Scott formed a group of scientists, engineers, and economists that became known in 1920 as the Technical Alliance—a research organization. Some of the better known names in the Technical Alliance are of interest, such as: Frederick L. Ackerman, architect; L. K. Comstock, electrical engineer; Stuart Chase, C.P.A. (now well-known writer); Bassett Jones, electrical engineer; Leland Olds, statistician (now Federal Power Commissioner); Benton Mackaye (now in the Forestry Department); Charles P. Steinmetz and Thorstein Veblen (both now dead). Howard Scott was Chief Engineer. In 1930 the group was first known as Technocracy. In 1933 it was incorporated under the laws of the state of New York as a non-profit, non-political, non-sectarian membership organization. In 1934 Howard Scott, Director-in-Chief, made his first Continental lecture tour which laid the foundations of the present Continental membership organization. Since 1934 Technocracy has grown steadily without any spectacular spurts, revivals, collapses, or rebirths. This is in spite of the fact that the press has generally 'held the lid' on Technocracy, until early in 1942 when it made the tremendous 'discovery' that Technocracy had been reborn suddenly full-fledged with all its members, headquarters, etc., in full swing!

WHY?

Technocracy's survey of the economic situation in North America leads to the conclusion that there is in development a process of progressive social instability, that this process will continue until the instability reaches the limits of social tolerance and that there then will have to be installed on this Continent a social mechanism competent to meet the needs of its people. Technocracy finds further that the day when social operations on this Continent can be based on a method of valuation has passed, and that it is now necessary that there be applied in the social field the quantitative methods of physical science. Technocracy, therefore, proposes that the North American Continent be operated as a self-contained functional unit under technological control. This control would operate the area under a balanced-load system of production and distribution, whereunder there would be distributed purchasing power commensurate with the resources and the continuous full-load operation of the physical equipment, with the guarantee of a high standard of living, equality of income, and economic security, at a minimum of working hours, to every adult inhabitant.

HOW?

At this stage the objectives of Technocracy are first, the education of the people of North America to a realization of the conditions behind the social crisis, and second, the organization of all those willing to investigate and interest themselves into an informed, disciplined, and functionally capable body whose knowledge and ability can be called upon to prevent chaos in North America at that time, now imminent, when the Price System can no longer be made to operate.

Technocracy Has the Solution

TECHNOLOGY HAS SOLVED the problems of production. Technocracy has the solution to the problem of distribution and social security. Technology demands social change, although most of the people of this Continent are not yet ready. When they are, Technocracy Inc. will also be ready. This Organization, therefore, is asking you: 'When are you going to start in earnest on the greatest constructive work in the social history of man?'

(SECTION STAMP)

TECHNOCRACY DIGEST

MAR. 46

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The Distribution of Abundance

The Biggest Job in History

The Pulp and Paper Industry

The Story of Electric Power

Economic Conditions in 1945

Facts About Plastics

1946

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TECHNOCRACY DIGEST

THE ONLY MAGAZINE IN CANADA THAT IS PREPARING THE PEOPLE OF THIS COUNTRY FOR SOCIAL CHANGE.

MARCH, 1946 VANCOUVER, B.C. No. 93

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The Biggest Job in History

Simply saying, 'We're taking over,' the veterans of World War II marched into the Old Hotel Vancouver . . . Within the next very few years the citizens of North America will be compelled to 'take over' the entire Continent, not just one building.

OCCUPATION of the Old Hotel Vancouver by war veterans is an event of the widest significance for our time. It is a vivid illustration in a social lesson which must be learned by the citizens of this Continent within the next very few years. That lesson demonstrates that we are rapidly reaching the limits of social tolerance in North America, and shows that the crisis can be resolved only by determined, disciplined action backed by mass approval.

For more than six months, various groups and individuals had been urging through letters, telegrams, resolutions and petitions that the old hotel be operated as a hostel for the service men who have returned to Vancouver to find housing accommodation non-existent. At 2:30 p.m. on January 27, 1946, 36 members of the New Veterans, Branch 168 of the Canadian Legion, brought to an abrupt end the months of stalling and buck-passing by civic, provincial and federal governments. Simply saying, 'We're taking over,' to the two M.P.'s at the door, they marched into the building which had been headquarters of the Pacific Command of the Army for the past six years. The advance party was followed shortly by an 'occupation force' of 100 veterans and their wives. Others came later.

To maintain high discipline, the veterans organized efficiently into committees. The next day a resolution was issued which stated in part: 'The veterans occupying the Old Hotel Vancouver feel that the problem of operating this building as a hostel is the responsibility of government bodies of all levels, civic, provincial and federal.' Announcing determination to hold the hotel against any move to oust them, the victors of World War II sat down to await developments.

They got fast action at last. Federal Minister of Veterans' Affairs Ian Mackenzie arrived

by plane. After a two-hour conference it was decided that the Old Hotel Vancouver would be opened in two or three weeks as a veterans' hostel, with the Greater Vancouver Citizens' Rehabilitation Council as legal tenant and operating agency, backed by federal and civic funds. With public approval behind them, Canada's warriors thus gained another objective.

The march of events within the next few years will force the people of North America to a far more drastic decision. They will have to 'take over' the entire Continent, not just one building. The pressure of unemployment and insecurity will compel them to operate the social mechanism of this Continental Area so as to provide abundance and security to **all** citizens.

That job will be the biggest in history. It will demand more determination and discipline than ever known before. It will require a Technological Army to keep the wheels of industry turning while the transition is being made. If the lines of production, transportation and communication stop, many of us will die.

It will need an objective great enough to satisfy the wants of the majority of our citizens; it will need an organization that can encompass every group and individual.

Technocracy has the Objective.

Technocracy has the Organization.

All we need is mass support.

—The Editor.

★ CANADA'S UNEMPLOYED registered at National Employment offices totalled 223,000 at Jan. 24, the Labor Department reported. The new figure was an increase of 23,000 over previous figures for Jan. 10. In the same period the number of unfilled jobs remained practically unchanged at 84,000.

★ THERE IS NO DOUBT that the present economic system in Canada and the United States is going through a serious testing period. Some say it must succeed this time or the system will have to go. I believe we may have a couple of chances left, but not many more.

—J. C. ADAMS, Director of the Central Ontario Labor Relations Institute

★ HAYEK CONCOCTS A UTOPIA of economic behavior and labels it *free enterprise*. He then draws the opposite extreme, a purgatory of regimentation, and labels it *planning*. The result is that any resemblance to economic structures, living or dead, is purely coincidental. —HERBERT HARRIS IN PM

The Crime of Your Life

Crime is increasing. Most crimes are caused by the present Price System conditions of scarcity, poverty, insecurity and under-privilege. When they install the Technate, the citizens of this Continent will eliminate the economic conditions which are largely responsible for crime.

POLICE Chief Charles E. Watkins of Fort William, president of the Chief Constables' Association of Canada, in the summer of 1945 warned of the possibility of a postwar upsurge of crime, particularly in the period of dislocation following demobilization and industrial cutbacks. J. Edgar Hoover, chief of the U.S. Federal Bureau of Investigation, recently stated that America is headed for a major crime wave, far surpassing that which swept the country after World War I. He said that more than 6,000,000 criminals are on the loose, many of them juveniles.

These predictions are coming to pass. The daily press is flooded with stories of murder, assault, robbery and a steadily rising swamp of juvenile deliquency.

The most alarming feature of these crimes is the extreme youth of a large proportion of their participants. There has been a marked upswing in the crime graph in the past six months, with the number of junior offenders (under 21) being particularly noticeable since V-J Day. Approximately 35% of our prison populations comprise persons in this age group.

It is worthy of note that the offences of juveniles are more serious of late. Young delinquents, who previously were content with such minor offences as fruit stealing, gasoline syphoning and petty thievery, are graduating to the major categories of armed holdup, robbery with violence, safe-cracking and even murder. Ironically, the older and supposedly more hardened criminals, who have always been blamed for further degrading the character of the youths incarcerated with them, are now asking for protection and segregation from the 'young hellions.'

What is the nature of the crimes being committed? The overwhelming proportion of them—at least 90%—stem from economic insecurity and malcontent.

Crime maps showing the districts where the homes of offenders are most numerous indicate a preponderance of them in squalid, slum-ridden areas where wretched houses are crowded into ugly, industrial settings. Only a straggling few offences are perpetrated by persons coming from the relatively more secure and more comfortable homes of the suburban districts.

In a recent survey of crime in this city, a Vancouver newspaper man learned that most junior criminals directly blamed society for the offences they were committing against it. Coming chiefly from miserable, underprivileged homes in poor sections of the city, they resent the indignities and deprivations imposed upon them, and hence have found it easy to slip into unlawful and revengeful ways of obtaining the means of living otherwise either denied them or rendered difficult to obtain. One frankly admitted he would prefer 'a life of being chased by the O'Shaughnessies' (underworld term for policemen) to the drudgery of a shoe-cleaner factory job. Others felt the same about logging, mining and other 'honest labor' jobs. It was, they felt, easier, more interesting and more lucrative to resort to anti-social means of livelihood.

Young prostitutes whom the reporter contacted in cheap restaurants and dancehalls held the same view as the boys. Starting their lewd practices often as early as at 15 years, the girls had grown weary of drab surroundings, scowling faces and scolding voices in broken homes, or of underpaid jobs as housemaids or factory assistants, and had begun to follow the primrose path. Myriads of clothes - hungry, love - starved and physically under-nourished girls were irresistibly lured into what they were led to believe would be gay, exciting lives with the promise of quick, easy money.

There is another kind of delinquency which illustrates the failure of society to meet a responsibility. Since this type does not spring immediately from poverty, only in the long-term view can it be attributed to economic conditions. This is the offence committed by persons who have had no adequate vocational or recreational guidance. It is the sort of offence accredited to a monetarily-speaking 'well-heeled' body of juveniles and persons in their early twenties, who characterized themselves a couple of

years ago in wearing their unique 'zoot suits' and committing various acts of mischief and violence.

These young people usually were the product of poverty-stricken districts which for the time being had experienced the affluence of wartime wages. Many of them, who had never before earned a dime nor half the time had had enough to eat, were earning up to $1.00 an hour in war plants. Since the money they received was not for the most part used to better themselves except to provide flashy clothes, it served principally as a medium for dissipation and riotous living. 'Eat, drink and be merry, for tomorrow we'll be out of work.'

They had never been taught to make good use of spare time, and no large scale provision was made to instruct them along professional, technical or cultural lines amenable to their desires. Since their energies were not put to social use, they were directed into channels of an undesirable nature, if not to society, at least to themselves.

There is a logical physical reason for this, for an explanation of which we shall refer to the Laws of Thermodynamics. Energy is a force always moving in one direction or another, with no preference which way except that it must be from a state of higher potentiality to another one lower down. For illustration we may consider a river which is a source of energy. By erecting dams, the power of the falling water can be utilized to generate electricity, which is useful to society in a myriad of ways. Otherwise the river may flow along without accomplishing any purpose, and at times because of lack of flood control may prove itself a definite social menace.

So it is with society itself. If the energy of its components is not directed into channels constructive to its whole, it must almost certainly be an unharnessed threat. This is the task of all society, not merely its familial constituents. It is as ridiculous to believe that the individual is completely responsible for all the benefits he must accrue for himself as it would be to envision one man mixing his own cement and transporting it with a wheelbarrow in an attempt to build Grand Coulee Dam for the benefits to be derived from it.

Two obvious conclusions may be deduced from the foregoing discourse on crime and its causes.

First, the alleviation of those economic stresses which are the bases of nine-tenths of all crimes would automatically reduce their commission to the point of almost complete elimination. Secondly, adequate provision of facilities for recreation and entertainment, vocational guidance, and unstinted training for all inidviduals, but more especially to those in their formative years, would discourage any tendency toward delinquency.

No such provision is made, however, and the lack of it has produced appalling results. Only those in preferred financial positions have been able to take advantage of such services as are extended by various privately-owned institutions. The rest of society is loosely divided into two classes — those who are attempting to live as closely as possible to accepted social tenets despite many handicaps; and those who have ceased to compromise with the shortcomings of the same tenets, and, in open defiance of them, are following the lines of least resistance to obtain their livelihoods. They are the 'criminals.' And what are criminals? They are, according to one definition, 'people with predatory instincts, but without sufficient capital to start a corporation.'

Their numbers are increasing, not only in Vancouver but throughout the rest of Canada, the United States, Britain and the whole world. Crime is worse now in Britain than it has ever been. A recent drive by the police of metropolitan London was aimed at rounding up an estimated 12,000 troublemakers, many of them deserters of the several Allied armed services.

And what measures are being taken to curb this rampant increase of crime? Virtually none, as far as scientific diagnoses and remedies are concerned. Practically every step that is taken is aimed at the effect of social revolt and not at the cause. 'An ounce of prevention is worth a pound of cure,' says an old proverb. On this basis, present society is using not so much as a gram of prevention while it is lavishing millions of dollars in buying tons of cure.

Cure? It might be well to examine our penal system just to see how effective the cure is.

While there admittedly has been some progress in recent years in the handling of criminals, for the most part they are still

dealt with as they have been all down through the centuries. Briefly the principle is to remove the offenders from society and place them behind bars (like so many caged animals) for as long a time as is deemed commensurate with the seriousness of the crimes committed. Whether or not the incarceration is considered more as a curative or punitive measure is obscure, but the results are by no means obscure. Graduates of penitentiaries and other 'crime colleges' are seldom reformed by their imprisonment. On the contrary, their increased 'know-how' gained from association with more professional prison mates frequently decides them to continue their careers of infamy. In addition they have become, because of their penal servitude, more revengeful than ever on society, and are generally determined to 'get even.'

Segregation of new from old inmates is one means of circumventing this difficulty. In British Columbia penal institutions the segregation falls into the following categories. Juvenile offenders up to and including 18 years of age are sent respectively to the Girls' and to the Boys' Industrial Schools. Offenders over 18 years, for sentences up to two years less a day, are sent to Oakalla Prison Farm where some segregation is made between first and multiple offenders. Those with sentences of two or more years are sent to the B.C. Penitentiary at New Westminster where there is no segregation. The latter two institutions have no overall policy or program for improvement of offenders.

Until World War II, there had been a 'Borstal' Home operating in this province for first offenders. Based upon its British equivalent, it was run on the 'honor' system which allowed considerable freedom of movement within the unwalled confines of the premises, and offered some opportunity for learning trades. Though still in the cradle stages when discontinued for financial reasons at the first of the war, it was growing and developing with considerable success. Only very few of its inmates betrayed the trust bestowed in them and were not ultimately rehabilitated in society. There is now agitation in some quarters to reinstitute the home.

The greatest improvement in present sentencing procedure over former practices is the tendency for magistrates to ask for

pre-sentence reports on first offenders before committing them. It is a reversion from the old Gilbert and Sullivan comedy opera theme of 'letting the punishment fit the crime' to the more appropriate idea of 'letting the punishment fit the offender.' If the pre-sentence report reveals that the offender has no previous record and that hitherto he has lived a reasonably decent life, there is a good chance of his receiving a deferred sentence. This obliges him to report at regular intervals to a parole officer and give accounts of his actions since his previous call. Failure to comply with parole regulations cancels his privilege and lands him in a cell. The important feature of parole sentences is that they result in automatic segregation from inured institutionalized criminals and also compel complete disassociation from persons and places of ill repute. Relative success of this procedure suggests to magistrates, parole officers and others in authoritative positions the feasibility of extending the plan to broader fields.

The major attempts at improvement of offenders are being made in institutions for juveniles. There they are given some instruction in agriculture, wood and metal work and various other handicrafts which to a degree fit them for a return to a useful place in society. The same practices to a lesser degree gradually are finding their way into the senior institutions.

All these measures can be recognized as being purely palliative. None aim at the root of the trouble. Though successful in a few individual cases, they are singularly ineffective in settling the crime problem which steadily increases. Threats of the lash in conjunction with regular sentences have not deterred criminal activity. The conditions which produce crime are being intensified with the dislocation of former warworkers and with the return of every World War II veteran unable to find a job or home. Crime will continue to increase as long as the conditions which encourage it endure, despite the augmenting of police forces, the expulsion of offenders from urban areas, warnings, harsher judgments or improvements in the penal system.

Where is there a solution to this problem? Certainly there is none within the Price System,

for it is predicated upon that very scarcity, natural or artificial, of which crime is merely a symptom. As technology increases with consequent reductions in manpower and spending power, the persons thus deprived of their means of livelihood are more inclined to obtain in whatever way they can some of those things being produced in profuse quantities — by criminal methods if necessary.

To understand the reasons for economic crimes, one must understand Price System operation itself. Primarily it depends upon the sale of man-hours for the production and distribution of goods and services. In return for man-hours of effort rendered, salaries and wages are paid in the form of money, a negotiable and transferable exchange medium, which is re-spent by the recipients to obtain the needs of life. As increased use of technological processes forces the scale of man-hours down, it also forces purchasing power down—to the point of elimination for the permanently disemployed.

Since money is negotiable and transferable, it can be spent by any person in possession of it. This leads to a free-for-all scramble by one and all to obtain, legally or illegally, more of this commodity which is the criterion of Price System success, the great amassment of which spells power. Those who are lucky enough can accumulate sufficient to support their families in comfort or luxury while the rest are obliged to struggle along on a pittance, going hungry while the nation's larders are crammed with food. The timeless struggle for money and the power and prestige it brings has been the history of the world — its wars, political manoeuverings, suppression of majorities by powerful minorities, and revolutions. Always it has been the manifestation of natural scarcity conditions.

A Price System basically relies upon conditions of natural scarcity, for only then can a price be put on commodities. If there is no natural scarcity, but rather natural abundance, as prevails on the North American Continent, scarcities must be artificially produced by destruction of surplus commodities. There is little incentive for one who has been technologically disemployed to remain 'honest' while his family goes in need of an article which he can not longer provide, but of

which he now sees great stocks being wantonly destroyed.

Let us now consider another method of distribution — that based upon the measurement of energy equivalents as proposed by Technocracy Inc. Energy, a definitely measurable factor, is required to produce all the consumer goods used by the people of this Continental area— or any other. Since here the human energy involved accounts for no more than 2% of the whole, it does not rate consideration, and those providing it are in no higher status than the rest of the population. Consuming power would be allotted to the individual in the form of Energy Certificates (see 'The Distribution of Abundance' in this issue) which would be non-transferable, non-negotiable and non-accumulative, i.e., they would be usable only during certain time periods like the wartime ration coupons. No one but the person to whom the Energy Certificates were issued could use them since they would show the bearer's name, age, occupation, sex and address. In the event of loss, new certificates would be obtainable, as the only purpose for their use would be to gear production to consumption and distribute to **all** citizens the abundance we are capable of producing.

Incentive for acquiring goods by anti-social means would **per se** fade in the light of such operation. It would be so simple to obtain personal needs through accepted channels that it would not be worthwhile to attempt any other method of obtaining them. Why steal a pair of shoes with the risk of undergoing severe social disapprobation upon discovery and possible consequent loss of certain privileges, when they can be easily obtained by simply applying for them in a shoe shop and having the number of energy units required to produce them subtracted by automatic energy-accounting machines from the total units on the certificate? This same reasoning applies to virtually every other item of consumer goods that could be mentioned.

But wait a moment. Earlier in this article it was mentioned that not only poverty but misdirected energies were responsible for crime. Would not the chance for this be even greater with as much spare time on hand as technological operation would allow?

Doubtless it would, but there

would be no incentive for such misdirection. Misdirection of energy is generally caused by a lack of social effort to expand and develop the inherent abilities of the individual. Normally, abilities and talents assert themselves early in life, and unless perceived and developed from that stage, the opportunity may be forever lost or irreparably damaged. Failure to develop an ability which is usually allied to the desired lifetime work of the person possessing it, frequently leads to frustration and a sense of inferiority. Energy, then, which would preferably have been spent by that person along constructive lines of his own choosing, is diverted into channels often harmful to society, and invariably unsatisfactory to himself.

In a Technate where expense would be no object and where ample time would be at the disposal of all, every effort would be bent by educators to learn the talents of the various charges under them. Once discovered, every facility on the Continent would be placed at their command for the most complete development. The only limitations imposed upon a student would be those inherent in his own personal makeup.

Here in capsule form is the method through which a problem that appears so insoluble under present social operation would be solved by the application of scientific principles.

Simple obedience to natural processes is the keynote of the answer. Denial creates in persons a desire to obtain, increasing or decreasing in direct proportion to the intensity of the denial. Ample provision of all things necessary to good living with an understanding of how best to enjoy them defeats suspicion and distrust, and breeds satisfaction and contentment.

North Americans have their choice. Either to continue in their present Price System path of poverty and crime which can lead only to complete chaos, or to accept Technocracy's proposals and march toward the greatest civilization ever known.

—Rupert N. Urquhart

★ CRIME SOARED to new proportions in 1945 setting a 10-year high for violent robberies and car thefts, Police Chief Alex G. McNeill announced in his annual report to the Vancouver Police Commission. Indicating an increased demand on the police force, the chief listed 247 cases of robbery and 1,520 stolen cars.

The Distribution of Abundance

In response to public demand we are publishing this long article on the distribution method which must be used in an economy of abundance. Compiled from the TECHNOCRACY STUDY COURSE *and other official literature, this material is available to the public in more complete form than ever before.*

THE present Price System grew out of the days of scarcity, when trading his crude materials, or stealing them, was the only way in which man could acquire the articles he needed. Through complex ramifications the trading system has grown until it is now the overwhelming structure of finance, business, commerce, and politics, in short, the Price System in toto—a gigantic structure, but still just a method of exchanging goods, springing from the ancient custom and necessity of barter. No intention or pretence is made of accurate mensuration or control; no physical accounting is involved; no accurate predictions can be made; and no stabilization can be assured. The Price System is simply a method of erratic exchange. In scarcity it sufficed well enough as an exchange method; in abundance it cannot even do that.

The dislocation of the commodity exchange method of distributing goods and services, and of economics in general, became apparent after World War I. The disrupted conditions at that time led to an investigation which in turn uncovered the astounding, yet almost obvious, fact that the only common denominator of all commodities and services is energy.

The scientists who pointed this out simply proposed to measure the total amount of energy used by the North American Continent in a given period; measure the energy cost of physical production and services; and use these measurements as the basis for the regulation of all Continental production and distribution.

Science and technology have no values; only measurement. The only method known to science in the measurement of the cost of all physical operations is that of the amount of energy consumed per unit mass, per unit time, per unit distance. Technocracy presents the only mater-

ial control of the conversion and consumption of extraneous (non-human) energy on this Continental area.

Technocracy will put into operation a Continental control of all flow lines of production and distribution—a Continental statistics expressing the desires of every citizen in his choice of consumable goods and available services. This system will do the following things in a physical entity where abundance is certain:

(1) Register on a continuous 24 hour-per-day basis the total net conversion of energy, which would determine (a) the availability of energy for Continental plant construction and maintenance, (b) the amount of physical wealth available in the form of consumable goods and services for consumption by the total population during the balanced-load period.

(2) By means of the registration of energy converted and consumed, make possible a balanced load.

(3) Provide a continuous inventory of all production and consumption.

(4) Provide a specific registration of the type, kind, etc., of all goods and services, where produced, and where used.

(5) Provide a specific registration of the consumption of each individual, plus a record and description of the individual.

(6) Allow the citizen the widest latitude of choice in consuming his individual share of Continental physical wealth.

(7) Distribute goods and services to every member of the population.

On the basis of these requirements, it is interesting to consider money as a possible medium of distribution. But before doing this, let us bear in mind what the properties of money are. In the first place, money relationships are all based upon 'value,' which in turn is a function of scarcity. Hence money is not a 'measure' of anything. Secondly, money is a debt claim against society and is valid in the hands of any bearer. In other words, it is negotiable; it can be traded, stolen, given or gambled away. Thirdly, money can be saved. Fourthly, money circulates, and is not destroyed or cancelled out upon being spent. **On each of these counts money fails to meet our requirements as our medium of distribution.**

Suppose, for instance, that we

attempted to distribute by means of money the goods and services produced. Suppose that it were decided that 200 billion dollars worth of goods and services were to be produced in a given year, and suppose further that 200 billion dollars were distributed to the population during that time with which to purchase these goods and services. Immediately the foregoing properties of money would create trouble. Due to the fact that money is not a physical measure of goods and services, there is no assurance that prices would not change during the year, and that 200 billion dollars issued for use in a given year would be used in that year, and if it were not used this would immediately begin to curtail production and start oscillations. Due to the fact that money is negotiable, and that certain human beings, by hook or crook, have a facility for getting it away from other human beings, this would defeat the requirement that distribution must reach all human beings. A further consequence of the negotiability of money is that it can be used very effectively for purposes of bribery. Hence the most successful accumulators of money would be able eventually not only to disrupt the flow line, but also to buy a controlling interest in the social mechanism itself, which brings us right back to where we started from. Due to the fact that money is a species of debt, and hence cumulative, the amount would have to be continuously increased, which, in conjunction with its property of being negotiable, would lead inevitably to concentration of control in a few hands, and to general disruption of the distribution system which was supposed to be maintained.

Thus, money in any form whatsoever is completely inadequate as a medium of distribution in an economy of abundance. Any social system employing commodity evaluation (commodity valuations are the basis of all money) is a Price System. Hence it is not possible to maintain an adequate distribution system in an economy of abundance with a Price System control.

We have already enumerated the operating characteristics that a satisfactory mechanism of distribution must possess, and we have found that a monetary mechanism fails signally on every count. **A mechanism possessing the properties we have enumer-**

ated, however, is to be found in the physical cost of production—the energy degraded in the production of goods and services.

This energy can be stated in invariable units of measurement —units of work such as the erg or the kilowatt-hour, or units of heat such as the kilogram-calorie or the British thermal unit. It is therefore possible to measure with a high degree of precision the energy cost of any given industrial process. This energy cost is not only a common denominator of all goods and services, but a physical measure as well, and it has no value connotations whatsoever.

The energy cost of producing a given item can be changed only by changing the process. Thus, the energy cost of propelling a Ford car a distance of 15 miles is approximately the energy contained in 1 gallon of gasoline. If the motor is in excellent condition somewhat less than a gallon of gasoline will suffice, hence the energy cost is lower. On the other hand, if the valves become worn and the pistons become loose, somewhat more than a gallon of gasoline may be required and the energy cost increases. A gallon of gasoline of the same grade always contains the same amount of energy.

In an exactly similar manner energy derived from coal or water power is required to drive factories, hence the energy cost of the product would be the total amount of energy consumed in a given time divided by the total number of products produced in that time. Energy, likewise, is required to operate the railroads, telephones, telegraphs, and radio. It is required to drive agricultural machinery and to produce the food that we consume. **Everything that moves does so only with a corresponding transformation of energy.**

Now suppose that the Continental Control (in the North American Technate), after taking into due account the amount of equipment on hand, the amount of new construction of roads, plant, etc., required for the needs of the population, and the availability of energy resources, decides that for the next two years the social mechanism can afford to expend a certain maximum amount of energy (equivalent to that contained in a given number of tons of coal). This energy can be allocated according to the uses to which it is to be put. The

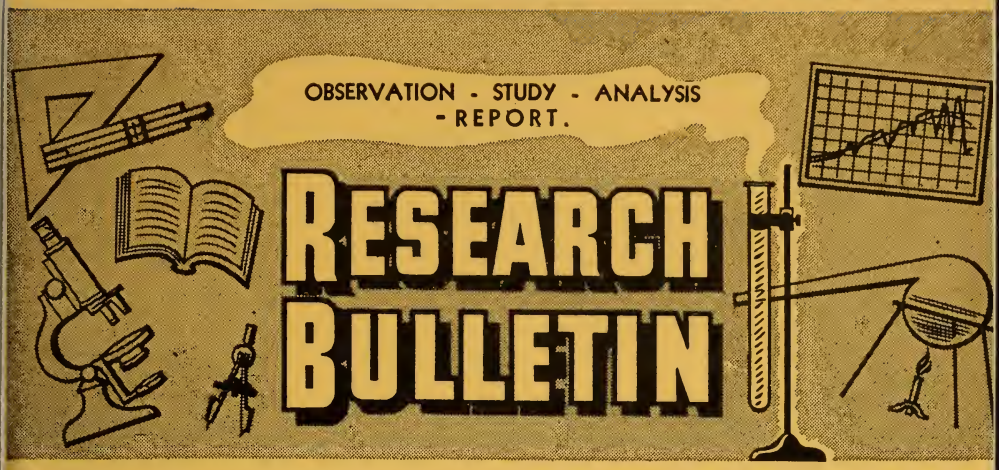
amount required for new plant, including roads, houses, hospitals, schools, etc., and for local transportation and communication will be deducted from the total as a sort of overhead and not chargeable to individuals. After all of these deductions are made, including that required for the education and care of children and the maintenance of hospitals and public institutions generally, the remainder will be devoted to the production of goods and services to be consumed by the adult public-at-large.

Suppose, next, that a **system of record-keeping** be instituted whereby a consuming power be granted to this adult public-at-large in an amount exactly equal to this net remainder of energy available for the production of goods and services to be consumed by this group. This equality can only be accomplished by stating the consuming power itself in denominations of energy. Thus, if there be available the means of producing goods and services at an expenditure of 100,000 kilogram calories per each person per day, each person would be granted an income, or consuming power, at a rate of 100,000 kilogram-calories per day.

Further details must be added to satisfy the requirements we have laid down. First, let us remember that this income is usable for the obtaining of consumers' goods and services, and not for the purchase of articles of value. That being the case, there is a fairly definite limit to how many goods and services a single individual can consume, bearing in mind the fact that he lives only 24 hours a day, one-third of which he sleeps, and a considerable part of the remainder of which he works, loafs, plays or indulges in other pursuits many of which do not involve a great physical consumption of goods.

Let us recall that every individual in the society must be supplied, young and old alike. Since it is possible to set the rate of production arbitrarily at a quite high figure, it is entirely likely that the average potential consuming power per adult can be set higher than the average adult's rate of physical consumption. Since this is so, there is no point in introducing a differentiation in adult incomes in a

(Continued on Page Thirty-five)



MARCH, 1946 Compiled by Editorial Staff No. 38

The Pulp and Paper Industry

PAPER-MAKING a century ago had nothing to do with wood; rags were the raw material for the few small paper-mills in Canada, the first of which had been established in 1803 at St. Andrews, Quebec. Just about the time of Confederation two plants, at Valleyfield and Windsor Mills, Quebec, began producing **wood-pulp.** The former introduced to America the mechanical process of grinding with stones and the latter employed the chemical process of separating the wood fibres with lye. The first sulphite pulp mill was installed at Merritton, Ontario, in 1887, and the first mill using the sulphate or kraft process followed in 1907.

The industry grew rapidly. During the years before World War I, Canadian paper began to enter American markets. Our mills began to specialize in newsprint paper, of which we now supply about 2½ million tons a year to U.S. newspapers. Their total consumption is about 32 million tons a year.

As the pulp and paper industry developed, faster machines were installed. The newsprint machines grew in size, too; some modern machines are hundreds of feet long. Other technical improvements also increased the efficiency of the mills. Sixty years ago the

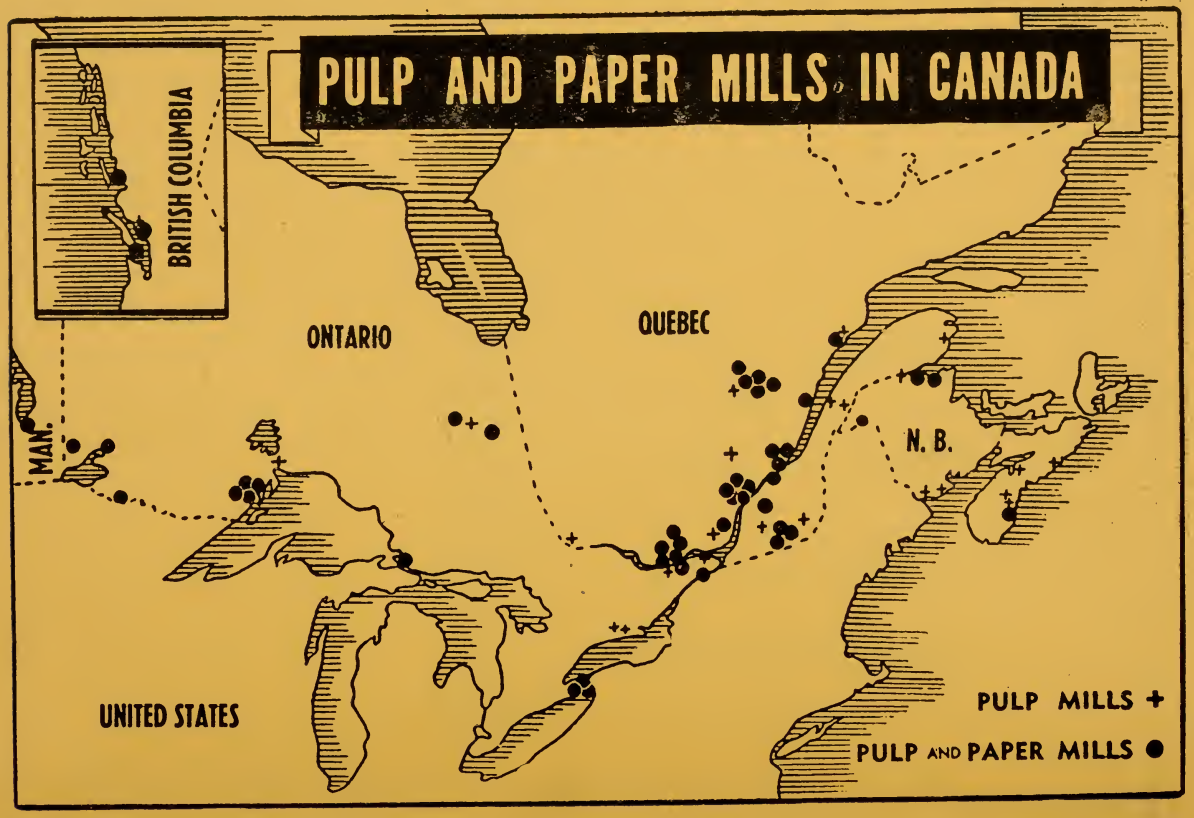
average capacity of a newsprint paper machine was 10 tons per day; now it is nearly 200 tons per day. The whole producing unit has grown to correspond. Half the newsprint mills have capacities of over 100,000 tons a year; three-fifths of all pulp and paper employees are in plants employing upwards of 500 workers.

As in nearly every other industry, there was a trend toward consolidation in the pulp and paper industry in the years after World War I. Some companies own several pulp and paper mills, power plants and transmission lines, hotels and housing developments in the mill towns. They employ crews in cutting pulpwood on extensive timber limits of their own and transporting it to the mills. One company operates six paper mills and one pulp mill. Three pulp and paper mills in Canada are wholly or partially owned by American publishers. There are some 16 companies making newsprint in Canada; five or six of these companies produce more than half the output. One hundred and six pulp and paper mills operated in 1943: 28 of them producing pulp only, 28 paper only, and 50 both pulp and paper.

Wood, water, power and transportation facilities combine to determine the location of pulp and paper mills in Canada . . . Thus we get the distribution of pulp and paper mills shown on the map opposite.

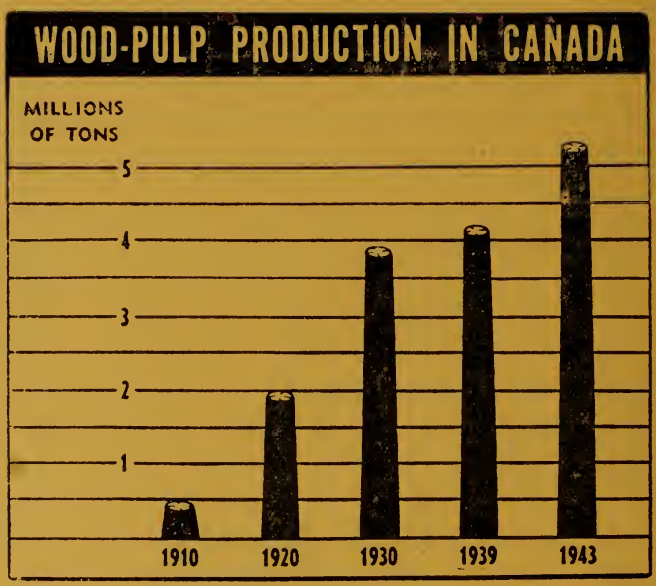
Let's see what goes on in a typical newsprint mill. Four-foot sticks of peeled pulp-wood, mostly spruce, travel up a conveyor from the yard to the interior of the mill. Some go to the grinders and are crowded against revolving stones which shred the wood to a mass of short broken fibres, to be washed down with pure water as a sort of thin gruel—this is groundwood pulp.

Other sticks are chipped fine, then the chips are screened, crushed and fed into digesters, tall cylinders where they will stew for hours under steam pressure in a sulphite solution. This solution is prepared by burning raw sulphur and leading the fumes up through a tower filled with broken limestone, while water trickles down. When the hot sulphite solution has 'digested' the lignin (which binds the cellulose fibres together in wood), the contents of the digester are blown out in a powerful jet against a bronze target in a pit, so that the wood


PULP AND PAPER MILLS IN CANADA
BRITISH COLUMBIA
ONTARIO
QUEBEC
MAN.
N. B.
UNITED STATES
PULP MILLS +
PULP AND PAPER MILLS ●

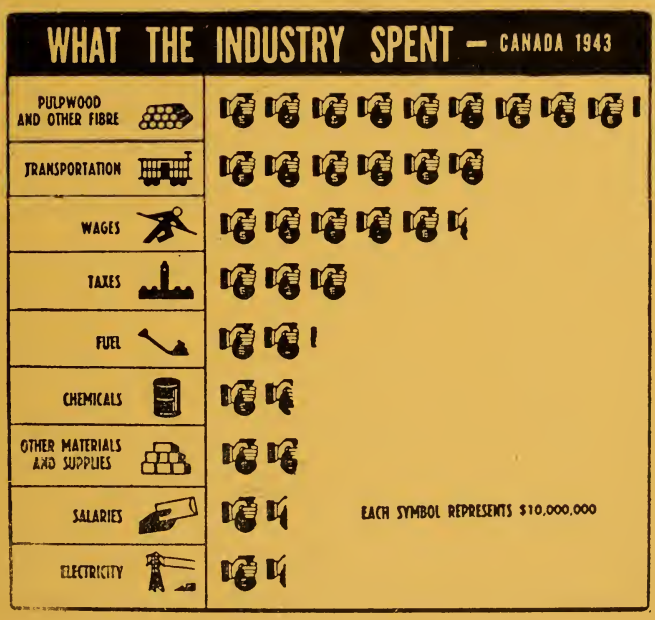
falls apart into relatively long tough fibres, which are then washed and rinsed to form a soupy mass of sulphite pulp.

Now the two are mixed, 85% groundwood pulp for bulk and 15% sulphite pulp for strength. After beating and refining, the thin mixture goes to the paper machine, where it flows out on a broad wire screen and, after losing most of its water, is formed into a damp continuous sheet; this passes at high speed to a heavy felt blanket which carries it between rolls and over heated cylindrical drums where it is further dried and pressed; finally it runs up over and around a series of rollers which smooth and finish the paper. Newsprint machines deliver paper over 20 feet in width, at speeds up to 1350 feet per minute (about 15 M.P.H.)



But newsprint, though the most important, is only one product of the pulp and paper industry. Others are book and writing paper, wrapping paper, paper boards, tissues, various kinds of pulp dried and sold for other manufacturing, such as the high-quality cellulose used for making rayon yarns, cellophane and plastics.

From the above we can see what are the main requirements of the industry, and why Canada leads in this field. Pulpwood, power and pure water, all in large quantities, are essential for the economic operation of a mill. More than 35% of Canada's total land area is forest, and about 43 million acres of it are considered accessible—the trees on them can be got at (and got out) commercially. These vast areas are capable of producing continuous crops of timber. Only the U.S.S.R. and Brazil have greater forest resources. In 1943 nearly 9 million cords of wood were cut for pulp. That would be a pile 4 feet by 4 feet by 13,333 miles—easily from Ottawa, east to Berlin and west to Tokyo. It was worth as raw pulp-wood some $90 million. A considerable part of the raw material comes from farm wood-lots; the pulp and paper industry buys pulpwood from farmers and settlers to the value of $15 million or more annually.



Along with forests, Canada has vast water-power resources. Turbines with a total capacity of 10 million horsepower are installed,

and a great part of this power is used to turn the machines in pulp and paper mills, while some is used in electric boilers to raise steam for the digesters and drying rolls. Of the total 28 billion kilowatt hours of electrical energy used in Canada in 1939, 11 billion were used by the pulp and paper industry. This predominance of the pulp and paper mills among the users of electric power has not been so marked during the war—both because the production of electricity increased, and because electricity was diverted for other war purposes.

But other agents and ingredients as well go into the manufacture of paper. Already mentioned are pulpstones, sulphur, limestone; we may add fuel for the boilers, chlorine for bleaching, felts and wires for the paper-machines; soapstone, lime, caustic soda, salt cake, alum, china clay, starch, rosin, dyes, other chemicals, rags and waste paper.

Thus many other industries and workers are kept busy serving the pulp and paper mills. The chart on the preceding page shows what the industry as a whole spent in 1943.

—Canadian Affairs, Reconstruction Supplement No. 4

EDITOR'S NOTE: *A modern social system directed by scientific and technological control will change the status of the present pulp and paper industry.*

The Story of Electric Power

IT is a far cry from the time when a university rejected the application of Michael Faraday, father of electricity, for a position as professor of physics, to the present world-wide use of electric power, servant of industry, agriculture, and the home. Men were puzzled by its elusive forces from the time of their first discovery at least 3,000 years ago up to the end of the last century, but nowadays the functions performed by harnessed electricity are extended year by year. New and more powerful techniques of its use are opening up new ways of life, and creating new needs as well as easier ways of meeting old needs. In Canada, development of water power has been one of the greatest forces in making available for use in industry

and the home the natural resources of farm, forest and mine. Significant in the growth of manufacturing is the fact that 50% of the total available water resources, and about 83% of the developed water power, are located in the highly industrialized provinces, in which there are no known adequate coal resources. Hydro-electric production has been increased greatly in the central provinces, and especially in Quebec, during the war, and they are now facing the need to secure peace-time users, while the other provinces are seized of the need for development of power and the servicing of many municipalities and farm homes hitherto without electricity. Just last month (November, 1945) an agreement was reached between Quebec and Ontario with the effect of setting in motion the latter's five-year program in which $200 million will be expended. This plan, for development of a site on the Upper Ottawa River, will provide employment for 15,000 workers.

After all the difficulties which beset the production of electric power in its early days, and the invention of apparatus to employ it, the distribution and use problems of today will seem relatively simple. It is recalled that Sir Humphrey Davy devised the electric arc lamp, but to produce light he needed a battery of 2,000 cells; as late as 1834 it still cost about $5 a minute. Edison took up the problem in 1877, spending $100,000 and trying 6,000 different substances before he produced a satisfactory filament for the first incandescent lamp. Canada has progressed rapidly in making use of electricity. The first telegraph line was set up in 1846-7, linking Toronto with Hamilton, St. Catharines, and Niagara Falls, and in the latter year Quebec and Toronto were linked. The telephone was invented in Canada, and in 1876 Alexander Graham Bell spoke a distance of 8 miles, from Brantford to Paris, Ontario. The incandescent lamp made its appearance in Canada in 1880, and two years later power developed by water flow was used to illuminate a sawmill in Ottawa, the earliest recorded operation in Canada. St. Catharines is credited with having the first electric street car service in the country, starting in 1887. It is not generally known that Canada pioneered in the transmission of electric power. Following development of the high-tension transformer, and improvement in insulating materials, a line was constructed in 1897

between St. Narcisse and Three Rivers, Quebec, the first high-tension transmission line in the British Empire. Five years later the 85-mile line from Shawinigan to Montreal was the longest in the world. Technical advances have resulted in the steady growth of transmission distances and voltages in Canada. At the beginning of the first world war, water-power plants in Canada had a total installed capacity of 1,700,000 horse-power; by the end of 1939, when the second war had just started, this total had grown to 8,289,000 horse-power, 4¾ times the installed capacity of 1914, and in January 1945 the hydraulic turbine horsepower was 10,283,763.

This expansion in the production of electric power from water is made possible by Canada's great fresh water reservoir with a lake area of 228,307 square miles, larger than that of any other country. In its flow to the sea, much of it from considerable altitudes, this water can be tapped again and again to operate turbines at points where there are rapids and falls. The available water power totals 25,439,000 horse-power under conditions of ordinary minimum flow, and 39,511,700 horse-power ordinarily available for 6 months of the year. These figures include only sites of which the actual drop or the head possible of concentration has been measured or carefully estimated, and in addition there are many unrecorded rapids and falls of undetermined power capacity, according to the latest report of the Department of Mines and Resources. In the current **Canada Year Book** it is recorded that the turbine installation at the end of 1943 represents slightly less than 20% of the present recorded water power resources. This estimate, involving 51,350,000 horse-power, is based upon the fact that it is feasible in most developments to install equipment with capacity considerably greater than the theoretical continuous power of the water fall.

Compared with other nations, Canada stands very high in electrical possibilities. She has a relatively small population, scattered throughout the Dominion, but remarkable industrial developments have been achieved because of the proximity of water power to her great natural resources, though the saturation point is still far distant. In 1938, Canada was second only to the United States in developed water power, and in potential water power resources

Canada ranked fifth among the nations. The Dominion has one great advantage in that abundant power is available within transmission distance of prospective markets, a condition not believed to exist in Russia, India or Brazil, the only other countries, besides the United States, outranking Canada's potential resources. Just before the war, the **London Economist** found the consumption of electricity per head of population to be: Great Britain 414, United States 771, and Canada 2,200 kilowatt hours, while the average installation per 1,000 population in Canada at the beginning of 1945 was 859 horse-power, a total which gives Canada an outstanding position among water power using countries.

What this development means in terms of manpower may be seen by comparing the results of muscular power and electric power. The labour of a strong man is said to be equal to about one-tenth of a horse-power, so the presently developed horse-power in Canada is equal to the labour of 103 million men. Electricity has become the greatest tool of the age, lessening manual labour greatly, and giving greater efficiency to productive activity through its flexibility and economy. This was revealed during the war, when the continuous flow of energy from power stations over networks of inter-connected transmission systems made possible Canada's tremendous production of war materials. All available power was absorbed, and there had to be, of course, a realignment of distribution to meet the demands of munition factories. Secondary power was diverted to primary use; there was a diversion of additional water at Niagara Falls; existing transmission lines and new lines were interconnected so as to permit the shuttling of power to the points of greatest demand; limitations were placed upon the use of street light, store window lighting, and outdoor signs, and there were other slight curtailments in the use of electricity for commercial and domestic purposes. Measures taken up to 1942 were satisfactory, but a deficit of power at that time resulted in an enforced reduction of output in the paper industry, and in other non-war activities.

After the first world war surplus power was diverted to some extent to the raising of process steam in the pulp and paper industry, and the use of surplus or secondary power in electric boilers reached

a maximum in 1937, when 7,313 million kilowatt hours were sold for this purpose. At the outbreak of the second war, a large volume of power existed that could be turned back to primary use in war industries. Primary power is the highest type of service, and the highest priced. It is available to the consumer at uniform voltage, 24 hours a day, up to the limit of his contract, while secondary power supply is indefinite and service is not guaranteed. During the period September 1939 to September 1943, production of primary power for use in Canada increased 84%, while secondary power was reduced by 67%, and instead of constituting 25% of the total power output of central electric stations it was only 5.4%.

Because of its abundance of water resources, Canada as a whole is not much involved in the question of water power versus fuel-generated power. More than 97½% of all electricity produced for sale in Canada or for export originates in water power. It is said that a ton of water would have to drop a mile to generate the same amount of energy as there is in a pound of coal, properly burned, but when coal and water power are equally plentiful the choice lies between hydro installation's high capital outlay but low running costs, and the lower installation expense but much high running costs of coal provision. In the long view, notice must be taken of the fact that water power resources are not diminished with use, while coal supplies do become depleted. Saskatchewan and Nova Scotia are the only two provinces using substantial quantities of fuel to develop electric power. New Brunswick and Nova Scotia have strategically-located coal; Saskatchewan has coal and lignite deposits; Alberta has coal, natural gas and oil; British Columbia has coal. In localities where adequate water-power resources are not available, fuel will continue to play an important part in development of power, but in Canada as a whole, power produced by water flow will continue to predominate. The Department of Mines and Resources points out that the equivalent of hydro-electric energy actually used in 1944 would be 25½ million tons of coal. In 1943 Canada's total coal production amounted to 18 million tons. Besides the fuels already mentioned, there are many practical and some as yet unproven ways of generating elec-

tricity. Tidal water power may become important in the Maritimes, though it has not been developed to date. Fumaroles (crevices in the ground through which steam escapes) have been developed in recent years so as to yield large supplies of steam for power generation. Italy set up four fumarole central power houses which develop 25,000 horse power to serve Florence, Pisa, and other cities, while four of the wells sunk in fumarole fields in California are said to deliver an average of 1,300 horse-power each.

More than 90% of Canada's hydraulic power is developed in central power stations, which include stations privately owned and operated, stations owned and operated by municipal or provincial governments, and stations selling or distributing electric energy whether generated by themselves or purchased for resale. In 1900 the total installation in central electric stations was only 33% of the total installation, whereas now it is 90%. The war-time increase in electric energy generated in central stations was 43%. There were, in 1942, nearly 20,000 persons employed, and customers numbered 2,126,000. The number of customers increased every year since 1920, except two, and the 18-year increase up to 1938 was 110%. While domestic service customers make up 80% of the increase, domestic service consumption of electricity is only about 8% of the total consumption.

Water developed power is the driving force of the machinery used in the manufacturing and mining industries, both of which relied upon electricity for more than one-half of their power needs as far back as 1923, and today electric motors do four-fifths of the work in these industries. In the 17 years prior to 1942, the increase in total capacity of power equipment in the two industries was 189% and in the ten years previous to the outbreak of war the number of electric motors in the manufacturing industry increased 41%.

Canada's mining industries are highly electrified. There was an almost continuous increase in hydro-electric power development for mining from the turn of the century up to 1941, when the war had a reducing effect upon gold and some other mining activities. According to a booklet published by Ontario's Hydro Commission, the first hydro-electric power to be used by the mining industry was gener-

ated on the Spanish River, one plant being completed in 1905. More than 80% of equipment employed in metal mining and in the smelting and refining of ores is operated by hydro-electricity supplied by central stations, and most of the small amount of fuel-operated equipment at the mines is for emergency use. The economy involved in use of hydro power enables the mines to treat lower grade ores than would be possible with any other motive power.

The pulp and paper industry is the largest individual buyer of central station power, using as much as 40% to 50% of all power sold for industrial purposes. War reduced this percentage to less than 25%, due to diversion of great amounts of power to munitions production.

There has been a steady growth in the use of electricity in the home, and Ontario's Hydro Commission reports that during the past 30 years kilowatt hours consumption per month has increased from an average of 21 to 185, while cost in Ontario has decreased from 5.8 cents to 1.19 cents per kilowatt hour. This is a long way from the surprise of guests at a banquet in Ottawa celebrating the opening of the newly electrified street railway in 1893, when it was announced that the meal had been cooked by electricity. The average number of domestic customers per 100 population has increased from 9 in 1920 to 16 in 1943, a jump of 77%. Electricity is wired into about 60% of all Canadian homes. There was an increase of 500,000 customers between 1930 and 1942; average domestic consumption per customer increased 400 kilowatt hours; and the average charge per kilowatt hour decreased 0.42 cents. Increase in the number of customers ranged from 20% in Manitoba to 64% in Nova Scotia during the years 1934 to 1943.

Electric power on the farm, much talked about today, would be no cure-all for the disabilities of agriculture, but it would make a substantial contribution to improvement. Electricity would be a great aid to farmers by increasing production, saving labour, and improving their standard of living at low cost. Larger output at smaller cost can be achieved by electricity in most kinds of farming, and advancing techniques in artificial sunlight, quick freezing of fruits and vegetables, and dehydration, open up new avenues of revenue-paying

activities. Dr. Lee de Forest has predicted that one of the next big developments in electricty will be a method of electrifying farms so that two and three crops will be harvested every year. It hasn't come to that yet, but proper use of electric power will increase farm income, and the growth of rural electrification indicates that farmers regard it as practical. It removes drudgery and inconvenience from farm work and farm living; it will reduce the working hours of the farmer, his wife and children; it will help to keep young people on the land. There are more than 300 uses for electricity on farms, according to the United States Rural Electrification Administration, because, unlike the city home, the farmstead is a miniature factory as well as a residence. Provision of abundant fresh water on a farm where cows are kept improves milk production and increases the poundage of butter fat, but this cannot be assured until electric pumps, keeping cisterns filled automatically, oust the old oaken bucket. To provide the average farm family of 5 with water for a year, and to supply water for 4 cows, 3 beef cattle, a team of horses, 12 hogs, and 150 poultry would consume 440 hours of hand pumping a year, equal to 55 eight-hour days. All of that can be eliminated by installation of an electrically-driven pump.

Due to war conditions and the need of industries for current, extension of power systems to rural areas has been curtailed during the past several years. Indeed, the situation has not yet brightened greatly. Shortage of materials, it was reported at the end of November, has held up farm electrification planned for this year in Manitoba, and only about half the farms looking forward to electric power will be served. However, indications are that many farmers will soon be carrying out the rite of burying a kerosene lantern at the site of new electrical installations to symbolize emergence from the farm's dark age. The Census showed that 19.8% of farms were electrified in 1941, including those which were using wind and gasoline electric charger plants. The provincial percentages, comparing 1931 with 1941, follow:

Province	1931	1941
Prince Edward Island	3.5	5.4
Nova Scotia	8.3	26.0

New Brunswick - - - -	8.6	18.5
Quebec - - - - - -	13.2	23.3
Ontario - - - - - -	12.8	37.0
Manitoba - - - - -	2.3	7.3
Saskatchewan - - - -	1.4	4.7
Alberta - - - - -	1.7	5.4
British Columbia - - - -	21.8	35.8

It was pointed out that the larger percentages in some provinces could be attributed to the fact that they had smaller farms, closer together and therefore easier to serve. In Ontario, lines were not generally built unless there was assurance of at least two customers per mile of line, while in Quebec one area had nearly 6 customers per mile.

Some farms may be denied the benefit of laid-on electricity, because they are located in areas of sparse population, or are cut off from normal service by physical barriers. In such cases, self-contained electrical generating units may be used. There is great variety of wind and fuel driven plants, to suit various sizes of farms and differing needs. A survey in Alberta indicated the average investment to be $400 in wind and fuel plants, and $700 in combination plants.

The spread of electricity for domestic and farm use is not only a benefit to those receiving it, but to many industries and their workers. Besides using great quantities of steel and copper, the electrical industry must meet the demands of consumers for hundreds of other products on which considerable manufacturing has been done. Figures are difficult to obtain, but it is estimated that for every 100 hours employed in line construction the manufacturers are called upon to produce equipment requiring about 300 man-hours of work. A United States appraisal sets the expenditure by every newly connected customer for appliances and equipment at $400, and asserts that in addition 35% of the new users of electricty will install water systems and plumbing at a cost of $225.

There were, in 1941, 211 establishments manufacturing electrical apparatus and supplies in Canada, with a combined capital of $128,-317,208. They employed 24,000 men and 9,000 women, and the gross

value of their products in a year was $178 million. Twenty-five years ago there were 100 plants, with a gross product of $34½ million.

There is no single figure that will give an 'average' cost of electricity, because this cost varies according to use, quantity and service. Comparisons between provinces and municipalities cannot be correct if they attempt to consider the cost of electricity in the aggregate of all services, since one section may charge a higher rate for domestic current and a lower rate for industrial current, while other sections have smaller bills for domestic use and higher bills for other purposes. With these limitations in mind, the following record of index numbers of the cost of electricity for domestic service in 1943 may still be interesting, though there have been changes in some provinces during the past two years. The index is computed on the base 1935 to 1939 equal to 100.

Prince Edward Island	94.12
Nova Scotia	89.03
New Brunswick	100.02
Quebec	97.19
Ontario	96.06
Manitoba	106.12
Saskatchewan	108.42
Alberta	89.18
British Columbia	100.54

Individual cost of operating household electrical appliances is very low, the cost per hour, as estimated by an electrical authority, being one-eighth to one-tenth cent for a 60-watt bulb; less than a half cent for an electric refrigerator, and one to one-third cents for operation of an electric iron.

In its peace-time use, electricity has given more than 60% of Canada's population the use of light, home conveniences and labour-saving machines which help living conditions. All provinces are determined that this boon shall be extended as quickly as possible to as many as possible of the remaining 40%. **—Royal Bank Bulletin**

Economic Conditions in 1945

General Economic Situation	1945	1944	Up	Down
Index of physical volume of business	212.5	236.8		10.3
Index of industrial production	228.7	267.0		14.3
Wholesale prices	103.1	102.5	0.6	
Cost of living	119.5	118.9	0.5	
Index of common stock prices	99.6	83.8	18.9	2.1
Index of bond yields	95.1	97.1		2.1
Bank Debits (000)	$68,384,814	$60,676,954	12.7	
Production and General Business				
Mineral production	157.3	226.2		30.5
Coal production (tons)	16,441,878	17,026,499		3.4
Manufacturing production	248.7	292.3		14.9
Cattle slaughterings (head)	2,601,944	2,014,700	29.1	
Hog slaughterings (head)	5,683,727	8,766,441		35.2
Creamery butter production (lbs.)	293,254,813	298,251,925		
Newsprint production (tons)	3,259,208	2,991,782	8.9	
Steel ingot production (short tons)	2,881,323	3,024,410		
Pig iron production (short tons)	1,777,958	1,852,628		4.0
Construction contracts awarded	$409,032,700	$291,961,800	40.1	
Consumption of firm power (000 K.W.H.)	31,912,761	35,150,741		9.2
Wholesale sales (11 months)	206.2	188.6	9.3	
Retail Sales (11 months)	180.9	166.7	8.5	
Carloadings	3,624,545	3,658,671		0.9
Employment general index	175.1	183.0		4.3

—Dominion Bureau of Statistics

(*Continued from Page Eighteen*)

manner characteristic of economies of scarcity. From the point of view of simplicity of record-keeping, moreover, enormous simplication can be affected by making all adult incomes, male and female alike, equal. Thus, all adults above the age of 25 years would receive a large income, quite probably larger than they would find it convenient to spend. This income would continue without interruption until the death of the recipient. The working period, however, after the period of transition would probably not need to exceed the 20 years from the age of 25 to 45, on the part of each individual.

Still further properties that must be incorporated into this energy income received by individuals are that it must be non-negotiable and non-saveable. That is, it must be valid only in the hands of the person to whom issued and in no circumstances transferable to any other individual. Likewise, since it is issued on the basis of a budget expenditure covering two years, it must only be valid for that two-year period, and null and void thereafter. Otherwise it would be saved in part, and serve to upset completely the balance in the operating load in future periods. On the other hand, there is no need for saving, because an income and social security are already guaranteed independently to each individual until death.

The reason for taking two years as the balanced-load period of operation of the social mechanism is a technological one. The complete industrial cycle for the whole North American Continent, including the growing period of tropical plants, such as Cuban sugar cane, is somewhat more than one year. Hence a two-year period is taken as the next integral number of years to this industrial cycle. All operating plans and budgets would thus be made on a two-year basis, and at the end of that time the books would be balanced and closed for that period. No debts would be possible, and the current habit of mortgaging the future to pay for the present activities would be completely eliminated.

If, as is quite likely, the public find it inconvenient to consume all their allotted energy for that time-period, the unspent portion of their allotment will merely be cancelled at the end of the period. The saving will be effected by

society rather than by the individual, and the energy thus saved, or the goods and services not consumed, will be carried over into the next balanced-load period. This will not, as will be amplified later, throw the productive system into oscillation, because production will always be geared to the rate of consumption, and not to the total energy allotment. In other words, if for a given balanced-load period the total energy allotment be equivalent to that contained in, say four billion tons of coal, this merely means that we are prepared if need be to burn four billion tons of coal, and distribute the resultant goods and services during that time-period. This merely sets a maximum beyond which consumption for that time-period will not be allowed to go. If the public, however, finds it inconvenient to consume that amount of goods and services, and actually consumes only an amount requiring three billion tons of coal to produce, production will be curtailed by that amount, and the extra billion tons of coal will not be used, but will remain in the ground until needed.

There are a large number of different bookkeeping devices whereby the distribution to, and records of rate of consumption of, the entire population can be kept. Under a technological administration of abundance there is only one efficient method—that employing a system of **Energy Certificates.**

By this system all books and records pertaining to consumption are kept by the Distribution Sequence of the social mechanism. The income is granted to the public in the form of Energy Certificates.

These certificates are merely pieces of paper containing certain printed matter. They are issued individually to every adult of the entire population. The certificates issued to an individual may be thought of as possessing some of the properties both of a bank check and of a traveller's check. They would resemble a bank check in that they carry no face denomination. They receive their denomination only when being spent. They resemble a traveller's check in that they possess some means of ready identification, such as counter-signature, photograph or some similar device, so as to establish easy identification by the person to whom issued, and at the same time remain

THE ENERGY CERTIFICATE ·USED·

THE TECHNATE OF AMERICA

(B)

(A) DISTRIBUTION CERTIFICATE 180 (E)

1940-41 (D)

(C) J.P. Hayes

9038·1·16794 (F)	12349 (G)	8·33···16·3 (H)	22···11 (I)
13090-23 (J)	205···21·05 (K)	H·76302 (L)	Z·97321 (M)
34-46···11·E·7·8 (N)		(O)	(O)

(A) AGE GROUP - COLOR
(B) SEX
(C) SIGNATURE
(D) PERIOD OF VALIDITY
(E) DATE OF ISSUE
(F) REGIONAL DIVISION AND REGISTRATION Nº
(G) REGIONAL DIVº OF ISSUE
(H) FUNCTIONAL SEQUENCE AND POSITION OF HOLDER
(I) Nº EMPLOYED AND UNIT OF SEQUENCE
(J) TOTAL CREDITS AND AMOUNT OF PURCHASE
(K) DAY AND TIME
(L) SERIAL Nº OF RECORDING MACHINE
(M) CERTIFICATE SERIAL Nº
(N) NATURE OF PURCHASE
(O) IDENTICAL PURCHASE

IT IS
A MEDIUM OF DISTRIBUTION
A COMPLETE BOOKKEEPING SYSTEM
A 24 HOUR INVENTORY
IDENTIFICATION AND RECORD OF HOLDER
A GUARANTEE OF SECURITY

IT IS NOT
A MEDIUM OF EXCHANGE
SUBJECT TO FLUCTUATION OF 'VALUE'
SUBJECT TO THEFT OR LOSS
SUBJECT TO HOARDING OR GAMBLE
A MEANS TO WEALTH OR PRESTIGE

THIS CHART IS BASED ON THE PAMPHLET "THE ENERGY CERTIFICATE" PUBLISHED BY TECHNOCRACY INC., 153 E 44TH STREET, NEW YORK, N.Y.

PREPARED BY THE RESEARCH COMMITTEE R D 1E369

No 8

absolutely useless in the hands of anyone else.

The record of one's income and its rate of expenditure is kept by the Distribution Sequence to ascertain the state of a given customer's balance. This is somewhat analogous to a combination bank and department store wherein all the customers of the store also keep bank accounts at the store bank. In such a case the customer's credit at the department store is as good as his bank account, and the state of this account is available to the store at all times.

Besides the properties enumerated above, our Energy Certificates also contain the following additional information about the person to whom issued:

The background color of the certificate records whether he has not yet begun his period of service, is now performing service, or is retired, a different color being used for each of these categories. A diagonal stripe in one direction records that the purchaser is of the male sex; a corresponding diagonal in the other direction signifies the female sex. In the back ground across the face of the certificate is printed or water-marked the two - year balanced - load period, say 1940-41, during which the particular certificate is valid. Also printed on the certificate are additional data about the recipient, including the geographical area in which he resides, and a catalogue number, signifying the specific Functional Sequence and job at which he works.

When making purchases of either goods or services an individual surrenders the Energy Certificates properly identified and signed. These surrendered certificates are then perforated with catalogue numbers of the specific item and amount purchased, and also its energy cost. These cancelled certificates then clear through the record-keeping apparatus of the Distribution Sequence.

The significance of this, from the point of view of knowledge of what is going on in the social system, and of social control, can best be appreciated when one surveys the whole system in perspective. First, one single organization is manning and operating the whole social mechanism. This same organization not only produces but distributes all goods and services. Hence a uniform system of record-keeping

exists for the entire social operation, and all records of production and distribution clear to one central headquarters. Tabulation of the information contained on the cancelled Energy Certificates day by day provides **a complete record of distribution,** or of the public rate of consumption by commodity, by sex, by Regional Division, by occupation and by age group.

With this information clearing continuously to a central headquarters we have a case exactly analogous to the control panel of a power plant, or the bridge of an ocean liner, or the meter panel of a modern aeroplane. In the case of a steam plant the meter panel records continuously the steam pressure of the boilers, the fuel record, the voltage and kilowatt output of the generators, and all other similar pertinent data. In the case of operating an entire social mechanism the data required are more voluminous in detail, but not otherwise essentially different from that provided by the instrument panel in the steam plant.

The clearing of the Energy Certificates, tabulated in all the various ways we have indicated, gives precise information at all times on the state of consumption of every kind of commodity or service in all parts of the country. In addition to this there is also corresponding information on stocks of materials and rates of operation in every stage of every industrial flow line. There is, likewise, a complete record on all hospitals, on the educational system, amusements, and others on the more purely social services. This information makes it possible to know exactly what to do at all times in order to maintain the operation of the social mechanism at the highest possible load factor and efficiency.

We find the Energy Certificate to be, then, a methodology of technological a c c o u n t i n g — a methodology of technological accounting which applies the same rigid mensuration that our mass-production of today employs, and has to employ, in its swiftly moving flow lines of intricate equipment and multifarious products.

The Energy Certificate is a methodology of mensuration and in use becomes a dependent, invariable and integral part of the totality of operations. By contrast, all media of exchange represent 'values,' fictitious or only

ostensibly based upon physical objects, distinctly apart from or merely a unit of the totality of operations. The media of exchange must always be restricted to processes of evaluation, and can never be a process of mensuration.

The Energy Certificate furnishes the individual with the means of maximum social expression and decision, since purchasing power is the only means whereby the individual as such can participate in directing the variations possible within the limits prescribed by the energy determinants of the area wherein he lives. The rate of flow of goods and services in abundant quantities can be controlled by no other mechanism than an exact means of distribution such as the Energy Certificate provides. Incidentally, the Energy Certificate is not applicable to any society operating under scarcity conditions, or any area dependent beyond a certain maximum upon other areas for its supply of energy and resources.

(The only real vote is purchasing power. What you buy you vote for. The people who attend wrestling matches in their thousands each week are voting for them each time they go. Every time you buy anything or use any service, you vote for a continuation of that thing or service, and in this manner help to weave the texture of your life and the collective life of the country. Unfortunately, the p u r c h a s i n g power of everyone today is unequal, which invalidates the real power of this consuming-power ballot. Under a Technate, however, everyone's consuming rights are equal and therefore everyone has an equal voice in what he or she shall have. There are no elected politicians to spend your 'money' for you, so you spend it yourself and directly represent yourself; nor do you need anyone else to help you. Each individual tells the Technate **what** shall be made, and the Functional Control says **how** it shall be made.)

The Energy Certificate furnishes the molecular mass with a medium whereby it presents its mandate unequivocally and continually to the administrative mechanism, without representation, delegation, referendum, or any other device of previous social administration.

Today, wealth is measured according to the possession of the medium of exchange. A person's

possession may have originated through channels either ethical or unethical, legal or illegal, socially detrimental or beneficial; but once in possession of the medium of exchange the holder may apply it with little thought to social responsibilities, the only limiting factors being his shrewdness and the volume of tokens at his command. And under modern corporate enterprise the volume at his command will far surpass that in his actual possession. The Technate will not prohibit by legalities these uses or abuses; the Energy Certificate mechanism automatically excludes all possibilities of their occurrence.

The Energy Certificate will not partake of that miraculous feature of a medium of exchange, expansion at a compound rate of interest. And it has nothing to do with that other convenient property of a medium of exchange which allows manipulation in such a manner as to result in a handsome multiplication of the leaven with which the first transaction is effected. We must mention, here, that the original nest egg may have been a borrowed one. Few laymen have bothered themselves to trace deposits and bank loans logically through a series of transactions. A truly munificent golden cow has been milked for its cream by the financial world.

The Energy Certificate eliminates both the basis and need of all social work, charity and philanthropy. It will reduce crime to but a small fraction of what exists today. That fraction will fall into the field of pathology. The reduction will not be due to any change in human nature, but to the absence of objects of 'value' and the lack of gain to be had. The element of a chance to win or the risk to lose disappears.

This means of distribution, based on a determinable change of physical cost per unit produced and of service provided, is not subject to fluctuations of 'value.'

The disappearance of 'values' in tangible objects with an advancing technology approaching full automaticity is a fundamental factor not anticipated by the Marxian theory of 'values,' nor by any other social philosophy. The disappearance of 'value' automatically invalidates all social philosophies as potential solutions of our social problems. Social philosophies are based on assumed **moral** values of human effort.

Previously, that item which was scarcest and involved the largest expenditure of human effort was the highest in 'value.' Now, in a sea of abundance, one who stubbornly holds fast to a social philosophy and 'values' is much like the poor hen who with bewilderment watches the ducklings she has hatched take to the water. She herself lacks the webbed feet required for swimming, and cannot understand such peculiar goings-on.

As a case in point, let us consider one compound without which no life can continue on this globe . . . air. Air has never yet been subjected to the operations of trading, financing, mortgaging, loaning, borrowing, evaluating or any other manipulations of the Price System. Why? Because its bountiful supply has never permitted the creation of a demand. With it there never has existed the opportunity of introducing the concepts of 'value' and human labor which form the basis of the Marxian theory.

The characteristics of air can be duplicated with any other needful thing, if we establish the requirement of abundance.

There might be much said in disposing of Major Douglas' Social Credit theory, Fisher's commodity dollar, Soddy's treatment of the monetary structure, and other such schemes. In theory they differ, but in application they all deal in evaluation and therefore must be declared inapplicable in an era of abundance where there are no values. It did happen that Soddy, an outstanding scientist, came remarkably close to the projection of the unique civilization required in an era of abundance —but ere too late he remembered that he was an English gentleman, inescapably charged with the preservation of all that for which an Oxonian tradition stands.

Inflation, deflation, fiat money, social dividends, etc., are—and have to be—dismissed as instruments for the distribution of an abundance of goods and services. They all presuppose a condition of scarcity with its corollaries of value; demand and supply, haphazard and meagre flow of goods and services, and a political interference control superimposed upon the functions of a national economy.

There can be no era of abundance without a New America.

The Energy Certificate will be the instrument of distribution in the New America.

Facts About Plastics

John Jones, the inquisitive coal dealer (see 'Men and Moelcules,' Technocracy Digest, July, 1945) seeks authoritative information on plastics, the most talked of but perhaps the least understood group of modern industrial chemical products.

(Continued From Last Month)

THE Chemist turned out the contents of his pockets on the desk and began to display the items, one by one.

'Here are a few of the forms in which plastics are most familiar to you,' he told Jones. 'This penknife, for example, has a phenolic resin handle. My wallet is made from cloth coated with a vinyl resin, although it looks like leather and wears just as well. These transparent sheets over the identification cards inside are probably of celluloid, the same plastic we find in a fancier form in the barrels and caps of my fountain pen and pencil. This odd button I've been carrying around probably was made from urea formaldehyde. My pocket comb is undoubtedly made from polystyrene, the rims of my spectacles are of cellulose acetate, and the cap on this little bottle of tablets was made from phenol formaldehyde. The stem of my pipe is of melamine formaldehyde and this gay cigarette case was made from the same plastic you see in the noses of bombers, methyl methacrylate. The fittings on my braces and suspenders were made from the same plastic, my shoe lace tips from cellulose nitrate, and the linings of my shoes from vinyl resin. And if you need another example, my dental plate is of methyl methacrylate.

'I could go on all day enumerating uses of plastics that are so familiar you probably take them for granted. I could tell you of a hundred applications of plastics in every room of your home, in the automobile in which you drive to work, and in the fittings of your office. You could not walk a single block along the main street of any city or town in Canada without seeing scores of applications of plastics, if you knew what to look for. If you think the Age of Plastics lies ahead, look about you. The Age of Plastics, Mr. Jones, is here!'

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The Chemist's burst of oratory left Jones speechless for a few moments.

'Gosh,' he ejaculated, 'I hadn't realized that plastics are so commonly used. The strap on my wrist watch, the fasteners on my brief case, that paper knife, and even those picture frames on your desk . . . why, yes, you could go on all day picking out familiar things made from plastics.'

The Chemist stuffed tobacco into his pipe and struck a light before returning to his main subject. He explained that, fundamentally, plastics fall into two main categories, thermosetting and thermoplastic. Thermosetting plastics, he said, are those which undergo change under heat and pressure. They polymerize into hard, infusible products that will not soften to any great extent on re-heating. The thermoplastics, on the other hand, do not undergo any chemical change under heat and pressure, but they do soften. As they cool, they harden into a solid state, but the process may be repeated any number of times.

'So the term "thermo" simply means heat, is that it?' Jones interjected.

'That's right,' The Chemist assented. 'Just keep in mind that some plastics can be re-shaped after being softened by the application of heat, while others remain virtually unchanged.'

He reached into a cabinet and brought forth a number of samples. There were bottles containing small, irregular granules of coloured materials. There were clear, glass-like rods and tubes, thin sheets resembling heavy 'Cellophane' and thicker sheets of transparent plastic, and a few odds and ends of strands and filaments which looked like catgut.

'These,' he explained, 'are some of the forms in which plastics are most familiar to the moulding and fabricating trade before they are made up in finished articles. Plastics, as a general rule, are supplied in six forms.

'First there are the moulding powders, like these small granules in the bottles, which are used for injection moulding, compression moulding, or extrusion. They are furnished in an almost infinite variety of special colours and formulations for the exact uses to which they are to be put.

'Secondly, sheets, rods, tubes and films are supplied to the fabricator by the original manufacturer, thus being in forms for convenient use in the making of

finished articles without the employment of costly and intricate moulding or extruding equipment in the fabricator's plants. Plastics manufacturers also supply extrusions of thermoplastic materials in almost any desired cross-section and of indefinite length. Casting resins, which are thermosetting materials and contain no filler, are compounded and fabricated to semi-final shape by the suppliers. Impregnating resins for fabrics, papers and other materials are supplied in powder form.'

'Now let me be sure I'm getting this straight,' Jones broke in. 'When you speak of a plastics manufacturer, you mean the producer of the moulding powders, rods, tubes, sheets, films and extrusions. And when you speak of the moulder or fabricator, you mean the producer of the finished articles. Is that right?'

'Right as rain,' said The Chemist. 'Actually, however, there are several classifications. There are plastic manufacturers who supply the powders; moulders and extruders, fabricators and laminators. The plastics material manufacturer has the same role as the sawmill operator who produces the lumber; the moulders, extruders, fabricators are comparable to the cabinet-maker who converts the lumber into furniture.'

'I'm clear on that point, I think,' said Jones. 'Now tell me what you mean by terms like compression moulding, injection moulding, extrusion and so on.'

'There are a variety of ways in which plastics are converted into finished goods,' The Chemist went on. 'I'll begin with compression moulding. A carefully measured amount of plastic moulding powder, sometimes in tablet form, is placed in a pre-heated, polished steel die. As the moulds close, heat is transferred to the plastic, which becomes viscous and flows to all parts of the die. The moulds are held closed to permit the moulded piece to solidify and cure, then opened and the finished piece is removed. Units up to 20 pounds in weight can be moulded by this method and intricate, undercut shapes are possible. The dies must be made by skilled craftsmen and are very costly. A development of compression moulding is known as "transfer moulding," in which thermosetting plastics are melted in a pot and the liquid is injected into the moulds as they are closing, thus permitting closer tolerances, more

delicate inserts, and a faster rate of moulding.

'In what is known as injection moulding, measured quantities of thermoplastic powders are fed from a hopper into a heating chamber and converted to a semi-liquid state. The hot material is forced through a nozzle into the cavities of a split die, which can be separated after cooling to eject the finished piece. This method is usually faster than compression moulding.

'Extrusion is the method of producing continuous rods, tubes and strips of any desired shape from thermoplastic materials. As in injection moulding, the powders are fed into a heating chamber from a hopper. A worm gear churns the material as it passes through the chamber and forces the viscous plastic through a die, from which it emerges as a continuous rod, tube or strip, depending upon the shape and size of the opening in the die.

'Lamination is perhaps self-explanatory. It merely means the bonding of plastics to paper, cloth, asbestos, wood and metal, with the plastic resin serving mainly as a binder. These result in strong, homogeneous sheets which can be easily machined, or which can be shaped as desired before the resin has fully cured. Another method of forming plastics to shape is known as pulp moulding, which involves a vacuum process.'

Jones scribbled industriously in his pocket notebook while The Chemist took a breather. 'Now this is becoming simpler,' he remarked, reviewing his notes with some satisfaction. 'You have told me that plastics generally fall into two classifications, thermo-setting and thermoplastic; that they come in six basic forms, and how they are used. But surely there are more than two main kinds of plastics. I must have read about hundreds . . . so many I can't remember the names.'

'Not so many as you might think,' The Chemist said. 'No doubt you are going by trade or brand names, of which there are scores, but actually only 15 or 20 basic types of plastics are in common use. These, of course, are available in many formulations, with each formulation furnishing a special qualification for a particular purpose. There is no such thing as a universal plastic, you know—no one plastic possessing every desirable characteristic. One melts in the heat of a summer's day, while another resists boiling

water. One has a surface which can be marred by a finger nail, while another has a relatively hard surface. Consequently, fabricators must consider all the requirements of the finished article and buy the right plastic for the specific job in hand. That is the advantage plastics have over almost every other known material. Because they are man-made, man can create variations to meet special needs, whereas in metals, wood or stone, there are limitations of the natural product which he cannot overcome.'

Jones asked for the names of some of the more common types of plastics and The Chemist promised to have a list typed and mailed to him.

'But there are a few for you to think about in the meantime,' The Chemist said. 'There are the methyl methacrylates, the clear, transparent plastic so widely used in aircraft. There are cellulose nitrate, which you know as celluloid, and cellulose acetate. There are the polystyrenes, the vinyls, nylon, polythene (known chemically as polyethylene), phenol formaldehyde, urea formaldehyde and melamine formaldehyde. That will be enough for you to go on.'

'Sure,' said Jones. 'That's about as nice a bunch of tongue-twisters as you could find anywhere and I'll have to wait until I get your list to find out what they all mean. But you haven't mentioned the soybean or sawdust kind of plastics. I'm chiefly interested in plastics of that kind, because we have such abundant raw materials for them in Canada.'

'I intended to tell you about them before, but we got off on side issues,' The Chemist said. 'I should have explained that, chemically, plastics may be derived from a host of basic materials. The leaves of the trees, the grain in the fields, and the very soil from which they grow contain the basic elements from which plastics are made, but it isn't quite as simple as it sounds. It is pretty much the story of nylon from coal, water and air all over again.'

'But haven't plastics been made from sawdust?' Jones persisted.

'If you mean by that, that plastics have been made from wood, you are perfectly right,' The Chemist said. 'Remember that celluloid is cellulose nitrate and that the raw material for its manufacture is the cellulose in wood pulp. The same holds true for its cousin, cellulose acetate. A new plastic is being made from another

constituent of wood, a substance known as lignin, which is taken from the waste liquors from the process of making paper. The process is complex and costly to set up.

'In thinking of the simple use of sawdust for plastics, you may have been confused by something you have read about the use of wood flour as a filler in the fabrication of plastic articles, particularly when combined with phenolic plastics. In such instances the wood serves to provide more mouldings per pound of plastic, with a resultant saving in cost, and adds some desirable properties to the finished product. Cotton and rag, asbestos, mica, graphite, and other fillers are commonly used in plastics fabrication, to attain certain desired results, but it would scarcely be true to say that these materials themselves are converted into plastics.

'It is true some plastics have been made from the protein of soybeans, but on a limited commercial scale. There has been much research in recent years towards the use of agricultural residues for plastics purposes and some progress has been made in utilizing corn cobs, wheat straw, peanut shells, wood flour, and even bagasse, the sticky, pulpy mass left after sugar is extracted from sugar cane. In almost every instance these materials are used as fillers, rather than as plastics.'

The sound of footsteps in the corridor indicated that The Chemist's business day was at an end, and Jones glanced guiltily at his watch.

'All this has been most enlightening,' he told his host, 'and I have a lot of good information to pass on to Tom. I can see where both of us have been off the rails in some respects in our thinking about the plastics business.'

★ AN ELECTRONIC SPECTROMETER which measures the concentration of elements in alloys and automatically records the results has been developed by J. L. Saunderson and co-workers at the Dow Chemical Co., Midland, Mich. The operation of the spectometer is fully automatic, from the time the metal samples are placed in the instrument until the analysis is recorded on paper. Up to fourteen elements can be analyzed simultaneously.

It is said that the accuracy obtained with the new instrument is equal or superior to that obtained by standard spectrographic methods, and that analyses can be made in a fraction of the time required when using the latter methods—in some cases forty seconds. This electronic method of measuring the intensity of spectrum lines eliminates the necessity for photographic and developing equipment and a microphotometer. —*Machinery*

Notes on Organization

★ WITH the launching of the first Technocracy Trans-Canada Lecture Tour, news of our Organization in Canada becomes of national interest. *Technocracy Digest* in this and succeeding issues will therefore publish brief items of organizational activity for the information of the public.

★ POINTS covered by Authorized Speaker A. A. Milligan on (Trans-Canada) Tour No. 11 (which began Jan. 14) include the following:

British Columbia: Vancouver, New Westminster, Port Hammond, Kamloops, Salmon Arm, Vernon, Penticton, Trail, South Slocan, Nelson, Creston, Cranbrook.

Alberta: Lethbridge, Medicine Hat, Calgary, Turner Valley, Red Deer, Edmonton.

Saskatchewan: Zealandia, Feb. 25; Saskatoon, Feb. 26; Zelma, Feb. 27; Prince Albert, Feb. 28; Humboldt, Mar. 4 or 5; Regina, 6, 7 or 8; Moose Jaw, 9 or 10; Estevan or Mossbank, 11; Melville and Killaly, 14 and 15. For additional information on places and dates in Saskatchewan write to Section 1, R.D. 10652, Technocracy Inc., 106-A 3rd Ave., S., Saskatoon.

Manitoba: Winnipeg, March 19. Remainder of itinerary not complete when going to press. For further information regarding the Manitoba portion of the tour write to Section 1, R.D. 9749, Technocracy Inc., 292 Main St., Winnipeg.

The Speaker will proceed to Eastern Canada and cover many points there and in Eastern U.S. before returning to his native West. In the next issue of *Technocracy Digest* we expect to carry a complete itinerary of all Eastern public meetings.

★ POINTS covered by Authorized Speaker Milton Wildfong on Tour No. 12 (which will extend from Jan. 15 to about March 15) include the following:

Vancouver Island: Nanaimo, Merville, Courtenay, Port Alberni, Parksville, Youbou, Duncan, Victoria.

U.S.: Seattle, Spokane, Lewiston, Newport, Port Angeles, Everett, Tacoma-Puyallup, Portland, Bellingham.

B.C. Mainland: Vancouver, New Westminster, Langley Prairie, Mission, North Vancouver, White Rock.

★ COVERING the Vancouver Island area visited by Wildfong on Tour No. 12, the following is the proposed itinerary of Authorized Speaker Herb Clark on Tour No. 13:

Victoria, Mar. 18 and 19; Duncan, 20; Youbou, 21, 22 and 23; Nanaimo, 24 and 25; Ladysmith, 26; Courtenay, 27, 28 and 29; Port Alberni, Mar. 30, 31 and Apr. 1; Parksville, Apr. 2.

For exact dates of public meetings at the above points, contact Section 1, R.D. 12348, Technocracy Inc., 720 Fort Street, Victoria, B.C.

★ UNDER the auspices of 11451-1, Technocracy Inc., Dr. D. C. Sayles, research chemist of Purdue University, spoke on atomic energy to a large audience in Calgary on Jan. 9. Questions on the lecture were answered by Dr. Sayles while the numerous questions on Technocracy were handled by Chairman J. Lebeau. Asked what he as a scientist thought of Technocracy, Dr. Sayles replied that he was in favor of it and that, because of its scientific background, it should be supported by every scientist.

★ AN intriguing typographical error (?) is to be found in the January 1946 issue of *Industrial Canada,* publication of the Canadian Manufacturers' Association. The lead article of this magazine carries the title 'The Investigation of German Technocracy by Canadian Scientists.' Now don't get excited! There is nothing about Technocracy in the article. The word should have been Technology. Peculiar how so many people, even in the highest places, confuse the two words. The dictionary doesn't.

★ IN its January issue, *Technocracy Digest* reprinted an article 'Technology Is Root of Unemployment' which appeared in three major U.S. labor magazines. The editor of each was sent a copy of that issue of the *Digest* together with the pamphlet *Man-hours and Distribution.* They were asked if they wished to exchange monthly copies with our magazine. All three replied that they would place the *Digest* on their exchange list. Ray Scott, editor and manager of the *Brotherhood of Locomotive Firemen and Enginemen's Magazine,* said: ' . . . This will acknowledge receipt of copy of *Technocracy Digest* for January . . . also pamphlet *Man-hours and Distribution.* Both of these I have found contain much valuable information and I am very pleased to have them.'

★ GOOD news for Technocracy in general and *Technocracy Digest* in particular was the recent return to Canada of two of our most effective writers. Fresh from the fight against fascism abroad, their help in the battle against fascism at home will be a boost to the magazine and the Organization. We have heard from them and they have assured us that you will soon be reading their articles.

★ WE wish to draw the attention of our readers to the article 'The Distribution of Abundance' in this issue. Since this material provides the most information on the Energy Certificate yet available to the public, we suggest that wide circulation of this issue be carried out. Next month we shall publish an article on the administrative set-up of the North American Technate.

★ THE staff of *Technocracy Digest* is making plans which will lead to an improved magazine. Look for the new feature 'Through the Technoscope' in the April issue.

★ A SURVEY IN TORONTO showed that not many of the young people who cut short their education to enter war industry are planning to return to school; only one percent of the girls, and about a fifth of the boys —ROYAL BANK OF CANADA

TECHNOCRACY

WHAT?

Technocracy is science in the social field. *Encyclopedia Americana* says: 'Whatever the future of Technocracy, one must fairly say that it is the only program of social and economic reconstruction which is in complete intellectual and technical accord with the age in which we live.'

WHEN?

Technocracy originated in the winter of 1918-1919 when Howard Scott formed a group of scientists, engineers, and economists that became known in 1920 as the Technical Alliance—a research organization. Some of the better known names in the Technical Alliance are of interest, such as: Frederick L. Ackerman, architect; L. K. Comstock, electrical engineer; Stuart Chase, C.P.A. (now well-known writer); Bassett Jones, electrical engineer; Leland Olds, statistician (now Federal Power Commissioner); Benton Mackaye (now in the Forestry Department); Charles P. Steinmetz and Thorstein Veblen (both now dead). Howard Scott was Chief Engineer. In 1930 the group was first known as Technocracy. In 1933 it was incorporated under the laws of the state of New York as a non-profit, non-political, non-sectarian membership organization. In 1934 Howard Scott, Director-in-Chief, made his first Continental lecture tour which laid the foundations of the present Continental membership organization. Since 1934 Technocracy has grown steadily without any spectacular spurts, revivals, collapses, or rebirths. This is in spite of the fact that the press has generally 'held the lid' on Technocracy, until early in 1942 when it made the tremendous 'discovery' that Technocracy had been reborn suddenly full-fledged with all its members, headquarters, etc., in full swing!

WHY?

Technocracy's survey of the economic situation in North America leads to the conclusion that there is in development a process of progressive social instability, that this process will continue until the instability reaches the limits of social tolerance and that there then will have to be installed on this Continent a social mechanism competent to meet the needs of its people. Technocracy finds further that the day when social operations on this Continent can be based on a method of valuation has passed, and that it is now necessary that there be applied in the social field the quantitative methods of physical science. Technocracy, therefore, proposes that the North American Continent be operated as a self-contained functional unit under technological control. This control would operate the area under a balanced-load system of production and distribution, whereunder there would be distributed purchasing power commensurate with the resources and the continuous full-load operation of the physical equipment, with the guarantee of a high standard of living, equality of income, and economic security, at a minimum of working hours, to every adult inhabitant.

HOW?

At this stage the objectives of Technocracy are first, the education of the people of North America to a realization of the conditions behind the social crisis, and second, the organization of all those willing to investigate and interest themselves into an informed, disciplined, and functionally capable body whose knowledge and ability can be called upon to prevent chaos in North America at that time, now imminent, when the Price System can no longer be made to operate.

Technocracy Has the Solution

TECHNOLOGY HAS SOLVED the problems of production. Technocracy has the solution to the problem of distribution and social security. Technology demands social change, although most of the people of this Continent are not yet ready. When they are, Technocracy Inc. will also be ready. This Organization, therefore, is asking you: 'When are you going to start in earnest on the greatest constructive work in the social history of man?'

(SECTION STAMP)

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TECHNOCRACY DIGEST

'One War Is Enough'

We Face a Crisis

Administration in the Technate

Are We Controlled by Credulity?

Power Saws - - Past, Present and Future

Miracle Metals of Tomorrow

Bursting the Uranium Atom

Through the Technoscope

1946

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TECHNOCRACY DIGEST

THE ONLY MAGAZINE IN CANADA THAT IS PREPARING THE PEOPLE OF THIS COUNTRY FOR SOCIAL CHANGE.

APRIL, 1946 VANCOUVER, B.C. No. 94

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'One War Is Enough'

I cannot understand how they (people) can be resigned to the prospects of another global conflict, so casual in their assumption that wars are inevitable, so damnably unaware of the consequences of their current complacency . . . —EDGAR L. JONES

ONLY a few short months have passed since the end of the most horrible war in history. And already talk of another war pollutes the air.

Technocracy has always realized that war will be popular as long as the Price System exists. War brings Price System prosperity. World War II produced the greatest profits in history. In the release 'Sanctified Salvation,' August 31, 1944, Continental Headquarters of Technocracy Inc. stated:

'Amid the Hollywood glamourizing of this Price System of ours and the too, too wonderful results of free enterprise in winning everything from the soap derby to the war, one great irony hits us in the face in the midst of our lush prosperity. Only during a total world war has the Price System of U. S. and Canada with all its slobbering inefficiencies approached full employment and prosperous living conditions. This startling fact must be apparent to every American today that only under a world war can our Government spend hundreds of billions of dollars, and only if our Government can continue to spend hundreds of billions of dollars can we as a nation continue to purchase apparent full employment and apparent prosperity. Only during a world war has the Price System of this North America been able to offer the glittering bribery to almost every segment of the national structure, a bribery so attractive that it seduces all citizens into the rapturous acceptance of more of the same, of more wages for the worker, greater salaries for the employed, higher prices to the farmer, more customers for corporate enterprise, and more and better rackets to create more delinquents . . .'

Under the Price System, men like war because it brings material benefits, with or without risk. What many persons apparently do not yet realize is that, with the

advent of the atomic bomb, war has become too dangerous—every region of the world becomes a potential battlefront and every citizen is engaged.

In an article 'One War Is Enough' (**Atlantic Monthly**, February 1946), a veteran of forty months of war duty blasts the apathetic attitude of today:

'Probably I shall be tagged as a psychoneurotic veteran of too much bloodshed when I say that I get alternately fighting mad and cold sick inside whenever I hear people talk about the next war. I cannot understand how they can be resigned to the prospects of another global conflict, so casual in their assumption that wars are inevitable, so damnably unaware of the consequences of their current complacency.

'Has everyone in this country lost faith in peace? Here we stand at the threshold of what could be a new and better world, and our fainthearted citizenry insists upon looking backward and muttering that what has always been must be . . . . '

If the people of North America remain in their present state of torpor at the approach of war, like birds hypnotized by a snake, they will surely be consumed.

Today on this Continent only Technocracy stands firmly against the drift towards war. All other organizations are part and parcel of the Price System—the system that cannot exist much longer in time of peace.

Operating under the rules of the Price System game, our political and business leaders have been guilty of technological sabotage for many years. And today those who conspire to wage war to perpetuate an outworn system are guilty of technological treason. Judgment will be made by the historical march of events, and the blame will lie equally on all who meekly permit our technological heritage to be sold out to Mars and Mammon.

—The Editor

★ REGINA.—Percy R. Bengough, president of the Trades and Labor Congress of Canada, said in an interview . . . that the logical solution to the rising tide of unemployment in Canada was reduction of working hours but without reduced pay. The Labor leader, who is on a tour of the west, said Canada had made labor-saving technical improvements in the last four years which ordinarily would have taken 25 years and to cope with this technical advance working hours across the country should be reduced to provide more jobs. —*Canadian Press*

We Face a Crisis

The conflict between the mounting force of social change on the one hand and our decadent institutional system on the other is generating a chaotic condition industrially and economically which appears to be heading toward a disastrous economic tailspin, and is building up a mental confusion which may lead toward a psychological debacle on the part of the people after the war. For 20 years America has been faced with the alternative of abandoning this Price System of disadvantage or of continuing to patch it up. The majority holders of debt claims have succeeded in patching it up through one crisis after another. The advent of war was not a social crisis in this sense but was an opportunity to maintain the status quo. The advent of peace, however, will present the most severe crisis of all to the Price System on this Continent . . .

—CHQ, TECHNOCRACY INC. (Dec. 31, 1943)

AS North America heads towards the greatest depression in history, the Pollyanna chorus is bursting into the refrain of 'a longer cycle of prosperity than ever before' in a manner reminiscent of the pre-war decade.

Typical of the Coue psychology of the 1930's is the article entitled 'Serious Depressions Can and Will Be Avoided' which appears in the January-February issue of **Predictions.** The author Henry R. Johnston, formerly president of Case Pomeroy and Co., and vice president of Manufacturers Trust Co., New York, is at present treasurer of the Committee for Economic Development (an association composed of twenty-seven of America's leading businessmen which is attempting to stimulate private enterprise). Here are some of the 'positive conditions' which Mr. Johnston hopes will 'suffice to make a repetition of 1929 and 1932 impossible':

'Growing acceptance of the Gospel of the Prosperous Customer.' Mr. Johnston explains this as 'a growing awareness on the part of businessmen and the general public that if you want to sell you must have a customer who is able to buy' and 'the necessity for private business to plan for a maximum of well-paying jobs after the war.'

The present stand of some of the largest companies in America is directly opposed to this 'trans-

lation into economic terms of the Golden Rule.' Since big business is operating under the laws of the Price System jungle, it naturally refuses to clip its claws. In fact, periods of depression and widespread unemployment may even be welcomed, because they provide opportunities to squeeze out or buy out smaller corporations which are unable to weather the storm.

'The technology of an indefinitely expanding economy.' To understand what Mr. Johnston means by this, it is necessary to quote his explanation in full: 'Our national production plant in the past has been able to turn out more goods and services each year with the same amount of workers. Although this dynamic quality may be a contributory cause of unemployment—since it is also obviously possible to produce the **same amount** of goods with **fewer** workers—still it holds within itself the corrective for the malady. For example, corporation X which hires 1,000 men to make electric washing machines, will be able five years from now to make the same number of machines with 900 men. What will happen to the other 100? They will, in an expanding economy, either be retained by the corporation to make **more** machines to meet an increased demand, or else they will go to make **new** products like television sets or helicopters, or else will be selling the new machines. For the demand, in the sense of the desire of Americans for more of the good things of life, is always present. There is always room for new and better products when our economy is in a healthy state. But to make effective this corrective to technological unemployment, the American people must keep on demanding ever more of the good things of life—must act upon the clear knowledge that we are living in an expanding economy. This is our perpetual frontier.'

The propaganda of an 'expanding economy' is a Pollyanna myth. Graphs of the long-term trends of the North American economy indicate that the period of most rapid growth has passed, and that already we have entered well into the second period of growth, that of levelling off and maturation. Disregarding Price System restrictions, the physical limitations of natural resources and the capacity of the citizenry to consume goods render continual ex-

pansion impossible.

In the early stages of this Continent's industrial growth, the man-hours per unit of production were decreasing but slowly, consequently employment grew at approximately the same rate as industrial production. Then during the period of most rapid industrial growth, the increased use of labor-saving machinery with the consequent decline in the number of man-hours per unit tended to retard the rate of growth of industrial employment. During this period, new jobs were still being created due to the expansion of industry, faster than the old ones were being eliminated due to its mechanization. Finally, as industrial production began to level off with no corresponding slackening in the increase of mechanization, there came a time when jobs were eliminated by labor-saving machinery faster than they were created by expansion of old, or the creation of new industries. For the period of North American industrial growth prior to 1920, it is entirely correct to state that the creation of new industries and the expansion of old ones increased the annual hours of employment; for the period subsequent to that date it is **entirely incorrect** to make the same statement. Chairman Krug of the War Production Board has estimated, on the basis of information received from 42 industries, that production after the war can be 87% above the 1939-41 average, with employment only 33% above that level. That would mean a gain of about 30% in output per man-hour.

'Habit of aggressive, competitive enterprise by business.' Far from producing prosperity, the competitive practices of the Price System force the manufacturer to displace men with machines to lower operating costs. This means that purchasing power is reduced, and leads to the social paradox, 'The more we can produce, the less we can consume.'

'Growing cooperation between economic groups.' The present industrial civil war makes comment superfluous.

Mr. Johnston ends his article on a note of economic uplift: 'We have, I repeat, most of the machinery we need to control and prevent future depressions. The outstanding question is, have we the knowledge and the determination to make this machinery work? I believe we have.'

In the same issue of **Predictions** the statistician of a leading Wall Street stock brokerage firm follows an identical talk-your-way-to-prosperity line: 'By now the American public should be convinced that a full-fledged prosperity lies in our laps for a period of from 3 to 5 years following the completion of reconversion. Nearly everyone is agreed that the pent-up unsatisfied demands of industry to re-equip itself with new machinery, and of individuals to make good their long-deferred demands for consumer durables will keep us agreeably occupied for such an interval . . . If those who look to a revitalization of foreign trade, and particularly to the assistance the United States can give to technically backward nations to bring them to a more advanced state of industrialization, are correct, a longer cycle of prosperity than ever before . . . is easily within the range of possibility . . .'

Unfortunately for bankers, brokers and businessmen, North America's social destiny is not shaped by nebulous hopes. When we survey the record for a generation, we find that not since 1913 has the American economy maintained itself, in the sense of plowing savings back into private industry at a rate to keep idle money low and employment high.

In 1914, war orders from Europe broke a gathering depression.

In 1917, the U.S. Treasury began to spend $35 billion for World War I.

In the 1920's large government outlays for highways, plus loans abroad (mostly defaulted), plus a new peak for installment credit, helped to keep employment high.

In 1932, Mr. Hoover organized the RFC and began the process of deficit spending. Mr. Roosevelt sped it up—though never enough to drive unemployment much below 8 million.

In 1940, Mr. Roosevelt asked for 50,000 planes, and launched America's $300 billion outlay for World War II.

The peak capital investment during World War II came in 1941, when private and public outlay was $21 billion, the highest in history. This declined to $14 billion in 1942 and $7 billion in 1943. But in these years, with that capital investment, productive capacity was vastly expanded. Steel capacity was boosted one-third (doubled in Canada), aluminum capacity more than ten times (five times in Canada),

and more machines and machine tools were turned out in four years than in the whole previous generation.

If you take $85 billion of war orders out of the national market, what do you put in? Where is the demand for enough new plant to employ as many workers in heavy industry as total war demanded? If you cancel the orders which directly, or indirectly, employ 30 million citizens, including the Armed Forces, what are the 30 million going to do?

These questions become the sharper when we realize that the other 35 million citizens producing goods and services for **civilians**, kept the nation better fed and supplied than ever before. While almost half the population were making guns or shooting them, the remainder were producing more butter than ever before. How is the economy going to absorb the men with the guns?

Some persons look to expanded foreign trade for full employment. But this cannot take up the gap left at home by cessation of war spending by government. The United States and Canada are so tremendously rich in productive capacity that it took both a vast domestic expansion and an equally enormous rise in foreign trade to achieve full employment during the war. American exports rose to $8 billion in 1942, $12 billion in 1943, $14 billion in 1944. In Canada, approximately 60% of all production during the past six years was for war uses, and almost 70% of war production was for export. But it took abnormal war-time imports plus a huge lend-lease program to make these exports possible; it took the greatest war of destruction in history to expend the mountains of materiel. Now that most of our markets have become more highly industrialized and self-sufficient due to the impact of total war, North America faces a sharp reduction in foreign trade —even if we lend other countries the money to buy our goods!

Businessmen and their spokesmen maintain that cumulative domestic demands and great savings will enable us to enjoy prosperity for a number of years —Mr. Bernard Baruch said ten years. But this assumption is unwarranted. A recent study of the Committee for Economic Development, covering farmers in New York State, showed that, while all of them had postwar wants, only 6% proposed to sat-

isfy them exclusively out of savings. The great majority of the farmers said they would either meet their wants from current income or forego them altogether. Another survey discloses that families earning $3,000 or under averaged only $460 of savings up to 1945. Yet they are 73% of all families. There is no great market in such figures. If these families spent every cent of their savings, the total would be under $10 billion—which equals running the war for a little over a month!

Others look to a vast public works program — a bigger and better WPA—for Price System salvation. Technocracy points out that even spending for social improvement on a scale beyond that of the New Deal will not suffice to give us full employment of machines and men. Let us take as our measuring rod the generally accepted estimate that about $40 billion of investment annually would be necessary for a $200 billion full-employment level of national income. Against that $40 billion, measure the fact that the whole TVA project since its beginning has cost only $1 billion, that $3 billion a year for fifteen years would wipe out every slum in America. As I. F. Stone has said, 'Peripheral spending to prime the pump is not adequate.'

Every Price System avenue through which we could escape from depression is closed. If North Americans continue dreamily to seek a Price System outlet, they will batter their heads against the wall of physical reality. The citizens of this Continent will save themselves many headaches if they **join** Technocracy and through this organized mechanism inform themselves as to how they can ensure their future security and have an abundance of goods and services.

—Donald Bruce

★ AFTER THE LAST WAR, controls were abandoned within a few weeks of the Armistice, but the Federal Reserve Board index of residential construction (1923-25 equals 100) stood at 44 for the year 1919 and at only 30 for 1920. Comparisons with World War I are also illuminating in regard to other forms of production. Then controls were much milder, and prices rose faster and higher. Prices of industrial goods, for instance, increased 88%, while production advanced only 20%. During World War II industrial prices were held down to a 21% increase, but despite this discouragement to enterprise, production jumped by 116%. On the basis of these facts it cannot be claimed that there is any direct correlation beween a free market and the level of production. —Keith Hutchison in *The Nation*

Through the Technoscope . . .

Science and Technology

★ TECHNOLOGICAL ADVANCES in the coal mining industry are dramatically demonstrated in an article 'Sleeping Giant' in the Feb. 9 issue of *Collier's*:

'The coal operator, faced with declining demand and cutthroat competition, has, up to now, had but one answer—more efficient production. Contrast the coal mine of legend with the modern mine of today. In the mine of legend all work was done by hand. The miner made his own explosive shots to blast the coal out of the seam. He rolled black powder into a long paper cartridge. He crimped a percussion in a piece of fuse with his teeth—and occasionally blew the top of his head off in the process.

'When the coal had been blasted he broke it apart with a pick and loaded it by hand. A mule, or a pony, hauled it away.

'Such mines have almost ceased to exist. To one degree or another, over 90 percent of the industry is mechanized today. To see what this means take a trip into one of the Island Creek Coal Company's mines at Holden, West Virginia. This company, which produces about 600 railroad cars of coal a day, is one of the most efficient in the industry. It is 100 percent mechanized. Its underground haulage system is as efficiently organized as any railroad. Electric locomotives haul 50-car trains. Many of Island Creek's mines have block signals.

'At the face of the coal, giant cutting machines take seven-inch bites out of the bottom of the seam. This permits the coal to break up after it is dynamited. Then the loading machines move in. They load a 5-ton mine car in less than a minute. It takes a man several hours to do the same job.

'As a result of mechanization, production per man at Island Creek has nearly tripled.'

Tracing another technological trend the *Collier's* article points out that through increasing the efficiency of energy converting devices, industry has managed to get more work out of a ton of coal:

'Where railroads used 175 pounds of coal in 1917 to pull 1,000 tons of freight one mile, they get the same results today with 115 pounds.

'It is the same story on an even more dramatic scale with the electrical industry. It used to take 3.5 pounds of coal to make a kilowatt hour of electricity. Today, the figure is 1.4 pounds. Some very efficient generating plants get a kilowatt hour of electricity out of as little as three quarters of a pound of coal.'

Through the Technoscope we see fewer and fewer man-hours required in the mining of coal, technological unemployment under Price System operation and the need for technological control of the industry under a non-Price System.

★ A BATTERY of 16 'electric eye' graders is the key to the processing of navy beans at the plant of Beans Incorporated in Isanti county, Minnesota. The beans come down a chute to a whirling 'saucer' from which they are picked up by a pneumatic device which is a sort of wheel with short spokes around the rim. The spikes are hollow and suction behind them picks up one bean on each spoke. The whirling wheel passes through a housing in which a light plays on the beans and passes on to the photo-electric cells or the 'electric eye.' If the bean is off-color, or if the wheel picks up a kernel of corn or other foreign matter in the saucer, the 'electric eye' pushes a trigger which knocks the bad bean or foreign matter off the spoke into the discard chute. Beans that pass, go on to an endless conveyor belt between the two rows of eight 'electric eye' graders which carries them to the weighing and bagging department on a lower floor. The battery of 16 'electric eye' graders can handle 40,000 pounds of beans every 24 hours. Sixty beans pass the 'electric eye' every second on each of the graders.

C. C. Furnas in his book *The Next Hundred Years* estimates that there are 'at least a million workers in this country (U.S.) doing routine tasks of sorting, inspecting, or controlling, who could be cheaply and successfully replaced by devices actuated by photocells.' The National Resources Committee in its survey on *Technological Trends and National Policy* states that 'even an ultra-conservative estimate of the number of workers whose jobs could be done better and more economically by the photo-electric cell and associated equipment would probably be at least 250,000.'

Technocracy asks, 'Why not?' Why should human beings have to perform boring drudgery that can be eliminated by the use of modern technology? With the installation of the Technate, the citizens of North America will no longer need to fear technological unemployment; instead they can utilize every technological development to shorten and brighten their man-hours of effort.

★ A GIGANTIC MACHINE which will turn out a complete, two bedroom low-cost concrete house in 24 hours has been announced by Carl L. Estes, Longview, Texas newspaper publisher.

Estes said the apparatus, to be manufactured in Texas soon, loks like an enormous hen laying an egg. It maneuvers on 12-foot high pneumatic- tired wheels to the desired building site. It then turns out the new home, ready for occupancy, save for the installation of window panes and finishing touches. It has an 18 by 11½ foot living room.

Declaring the machine will help meet a presidential request for 2,700,000 housing units, Estes said it had been developed after years of research by R. G. LeTourneau, Peoria, Ill., manufacturer.

★ TECHNOLOGICAL UNEMPLOYMENT for airplane pilots is seen with the disclosure by the U.S. Army Air Forces of a real push-button plane. When a button is pushed, the Lockbourne Army air base announced, the four-engined cargoship (C-54) will take off, fly a pre-selected course and land without a human touching its controls.

This is made possible through the use of automatic equipment perfected since

the end of the war. The automatic devices, when pre-set to a determined plan of flight in advance, control and navigate the plane, its climb to desired altitude, flight to destination, landing and stopping on the landing strip. The landing gear and flaps are retracted after take-off, radios tuned, power-setting made, navigational reading corrected, landing gear and flaps extended for landing, and brakes applied to steer and stop the plane after landing, all without aid from the pilot.

The pilots and crew assume the role of passengers and do nothing but monitor the automatic equipment. The plane is not designed to fly without an occupant. The push-botton plane differs from the so-called 'robot' plane controlled by a pilot in a mother ship.

★ SYNTHETIC CAFFEINE will be produced by the Monsanto Chemical Co. in a proposed million-and-a-half dollar plant. The raw materials will be air and water.

★ FOUR DISTINCT TYPES of sugar-beet harvesting equipment were recently seen in actual field operation of farms near Fort Collins, Colorado. The Mars sugar-beet harvester picked up the beets in the row by the use of a six-foot spiked wheel and topped them with a blade at the top of the machine. The beets were moved on a belt to the truck alongside.

The International Harvester machine topped the beets in the ground, then dug and elevated them to a platform over a large hopper. Workers picked the beets from dirt clods and dropped them into the hopper, which was unloaded mechanically in the truck when full.

The Scott-Viner sugar-beet harvester dug the beets and carried them by the tops between two endless chains. A circular knife topped them before they were elevated into the truck alongside.

The John Deere sugar-beet harvester tops the beets in the ground, then digs them and carries them alongside the machine where they are piled in windrows to be picked up by a mechanical loader.

★ AMONG THE PLASTICS on display at the recent Plastic Exhibit in Philadelphia was a new plastic known as Styraloy. This plastic, developed by the Dow Chemical Co., Milland, Mich., for secret military uses and for cable sheathing, has properties that place it in the field between the rigid plastics and rubber. It is the lightest in weight of all Dow plastics, and will float on water. Its flexibility at low temperatures is one of its outstanding characteristics. When combined with synthetic rubber, Styraloy imparts more flexibility at low temperatures and better electrical properties, and reduces water absorption. It also provides more uniform flow and better surface finish, which contributes to lower fabrication cost.

★ AN EXPERIMENTAL gas turbine is being built for use on railway locomotives by the Westinghouse Electric Corporation. At least two of the 2000-shaft-H.P. units will be installed in a single locomotive. The new unit is the simplest form of gas turbine, and the power is conveyed to the locomotive driving axles through generators and motors. The gas turbine power output

is several times that of a Diesel engine of comparable weight and size, and the gas turbine is competitive with the Diesel engine in fuel cost.

★ A MANUFACTURER of water supply equipment has increased his production of shutter type strainers for use in deep water well pumps 300 percent by replacing the former combination of mechanized and hand arc welding with the Unionmelt electric welding process, developed by the Linde Air Products Co., New York City. It is said that superior appearance and improvements in weld quality were also obtained with the automatic welding installation.

Business and Finance

★ INFLATION is being called the number one current problem in North America. The latest list of 28 items of business statistics issued each week by the U.S. Department of Commerce shows that every single item reflecting prices or financial conditions is higher than the corresponding figure for the same week one year ago.

We have a growing commodity price inflation which is not as yet and in itself of very serious proportions. Its most dangerous feature is that it is flourishing in the company of a number of other inflations which in combination can cause a lot of trouble. There is a farm price inflation and an urban properties inflation. There is an inflation in the costs and prices of houses. There is a flourishing inflation in the prices of common and preferred stocks, and there is an unprecedented inflation in the prices of bonds.

The economists of United States and Canada are badly worried about the danger of inflation. In response to a questionnaire sent by the *New Republic* to 49 universtiy and business economists and groups of economists, 39 of the 43 who replied stated that the U.S. Price Control Act, which expires June 30, should be extended without delay.

Dr. Alvin H. Hansen of Harvard University said: 'A continuation of price controls is most urgently needed. Without it, I feel that we are in very serious danger.'

Dr. J. J. Spengler of Duke University: 'Present situation three times as serious as 1918 when credit inflation facilitated postwar inflation.'

Fifteen of the University of California economics faculty noted that pressures are approaching a breaking-point. They favored continuing price controls with strengthened authority for another year.

In an article 'Inflation Will Get You If . . .' in the Feb. 10 issue of *PM*, former New York Mayor LaGuardia warned: 'Unless care is taken, we are in for a good dose of inflation . . . The situation is serious . . . What can be done? The most important is to retain price control of all necessaries of life, prevent black marketing. Prudent purchasing until full production sets in. Watch prices and buy only what is necessary. Hold savings in the bank. Save more. Hold all War Bonds. Hold all securities. Do not part with investments. Do not pawn valuables. Do not play the ticker. Do not play the horses. Do not roll the bones. Pay insurance premiums promptly. Buy a War Bond in-

stead of a luxury. Do not hoard. Buy only for daily current needs. Work harder and produce more. Settle strikes and get production going. Do not pay above ceiling price no matter how much you need the particular item . . .'

LaGuardia's exhortations to the public will be about as effective as telling a child not to play with Christmas toys—when you leave them in reach and go out of the room.

Even more than during World War II, we need Total Conscription of Men, Machines, Materiel and Money, with National Service from All and Profits to None. Total Conscription can eliminate inflation, unemployment, strikes, and other current problems. Only through such a program can we chart a safe course on the troubled waters of the postwar world.

★ THE SUDDEN SLUMP in New York stock prices on Feb. 25 (which was the worst break since 1937) recalls the business and financial events which culminated in the 1929 crash.

On Jan. 1, 1929, the market had, as at present, been rising almost steadily for four years. The market value of all shares listed on the New York Stock Exchange had increased nearly threefold, from the $27 billion of Jan. 1, 1925, to about $67.5 billion. This time the non-professional speculators had really taken the bit in their teeth and raced the market to ever higher levels. New issues of securities during the first ten months of the year totaled $3.3 billion. But in September the decline began with a fall of the Fisher index of prices of industrial stocks from 211 on the seventh to 198 on the thirtieth.

Few persons foresaw what was to happen. (The group headed by Howard Scott which became known as Technocracy in 1930 was an exception; as far back as 1921 it had predicted an industrial and financial crisis by 1930.) Early in October, public 'confidence' buoyed up the market again, and on the fifteenth Professor Irving Fisher of Yale announced that stock prices stood on 'what looks like a permanently high plateau.' President Charles W. Mitchell of the National City Bank said, 'I see no reason for the end-of-the year slump which some people are predicting.' That very day prices fell five or six points a share. They dropped again on the sixteenth. On the nineteenth, although it was a Saturday, the losses were from five to twenty points. On the following Monday, more than six million shares were dumped on the market. On Oct. 23, even the most inactive stocks declined between 40 and 96 points, and the loss in the total value of the stocks exceeded $4 billion. The next day was Black Thursday, when 12,894,650 shares were sold, and prices fell further than in all the history of the Exchange.

Remembering 1929, many economists and businessmen are fearful of a repetition of those doleful days. Expressing that fear while trying at the same time to promote public confidence, the Vancouver *Daily Province* states in an article 'Bears Blamed for Stock Slump' (Feb. 26): 'The greatest worry of the bear group is that stocks might become strictly one-way streets, where they go all the way up without a break and then drop the full way down with a thud that might seriously shake the business world.'

In public lectures Howard Scott, Director-in-Chief of Technocracy Inc., has colorfully predicted what will probably happen unless drastic measures are taken: 'In 1929 we dropped out of a twentieth-story window and landed on the pavement; next time we will drop out of a fortieth-story window and go right through into the sewer.'

Total Conscription can prevent such an event. With its adoption we will freeze the price structure and eliminate entirely 'legalized gambling' in stocks.

Veterans' Affairs

★ A STRIKING SURVEY made in Montreal of a basic group of 4,333 veterans, discharged during the period June 1 to Sept. 15, 1945, shows that of the married veterans only 4 percent owned their own homes; that 50 percent were in rented houses; that 12 percent were awaiting the arrival of their wives from overseas; and that 34 percent were living with relatives or sharing apartments and rooms with others.

Of the 50 percent in rented houses the report finds that one-half were satisfied with the accommodation which may be appraised as 'adequate for the present;' that one-quarter were dissatisfied, clearly uncomfortable and in need of early change because of cramped space, or exorbitant rental rates, or both. The remaining one-quarter, to quote the report textually, 'are in distressing situations of intolerable squalor, discomfort and unsanitary conditions.'

The report cites the following as a specific case: 'Living in a filthy 2-room apartment on the third floor, water in hall, gas on second floor, toilet on second floor, small heater (called furnace) on second floor. No heat in house —no bath.'

Before our heroes become too disgusted with their hovels, the Canadian Government had better institute Total Conscription of Men, Machines, Materiel and Money so as to provide an all-out housing construction program.

★ THE FIRST DEMONSTRATION in Montreal of veterans of this war took place on Feb. 16, when the Federation of Labor Youth, many members of which wore veterans' discharge buttons, staged a speaking and placard-parading program for more than an hour. The demonstrators criticised government inaction in providing jobs, houses and adequate training schemes.

A youth trek to Ottawa was announced for some time in March.

Using loudspeakers, one veteran told of applying for an electrical course into which he and 220 others were accepted. He said two days before the start of the lectures, the Department of Veterans' Affairs notified them the classes were cut to 20. Asking what other courses were available, he was told only one—that of undertakers.

★ THE PURPOSE OF SCIENCE is to extend our knowledge and thereby our control of the forces of nature. The whole history of civilization is witness to the compelling necessity of this process. Any danger to mankind lies in the destructive use of discoveries which could have been used for its benefit.
—Enrico Fermi and Executive Committee of Los Alamos Scientists

Administration in the Technate

The Technate of North America will be a union of all the operations in this geographical Area into one functional organization to ensure the efficient and harmonious integration of our Continental factory for the production and distribution of abundance to the entire population.

OUR Price System governments are totally incapable of solving North America's present social dilemma. Our politicians are the symptom doctors of society. They look upon such problems as housing, strikes, unemployment and inflation as separate entities and attempt to treat them as such. They do not seem to realize that these problems are but the surface manifestations of an outworn social system and that they are related to each other.

In fairness to our politicians, let us point out that even though they might be honest and sincere men, they are part and parcel of a system of control which arose from ages of hand tools and scarcity; they are therefore incompetent to deal with today's **technological problems.**

The solution does not lie in changing from one political party to another—which only means voting for more of the same. Political administration in its entirety is as outmoded as high button shoes. A new mode of control is needed; a control technic which will bring a higher standard of living to every citizen, guarantee security from birth to death, give full freedom of action to all (providing that action does not interfere with the welfare of other citizens), and utilize the installed technology, natural resources and the skilled personnel of North America for the production and distribution of abundance with a minimum of human toil and a minimum wastage of non-recurrent resources.

There is, and can be, only one solution—the total abandonment of our antiquated, pre-technological social structure and the installation of a type of administration which is designed to conform with the changes which technology has wrought in the means whereby we live. Such an administration has been blueprinted by Technocracy Inc.

In order to visualize the ad-

ministrative set-up which Technocracy Inc. is proposing, we must try to picture the entire North American Continent as a single geographical, technological, operating unit. We must forget all the present individual business establishments which are competing one against the other in a ceaseless struggle for existence. There is no room in a Technate for the chiselling tactics and wasteful duplication practised by the so-cllaed 'free enterprise' of our present social system.

We must likewise forget all the present small, individual, political entities which are operating as separate autonomies within the Continental Area. These small entities are irregular in shape and size, and their name designations give us no indication of their geographical location. The primary reason for their existence seems to be for the purpose of collecting revenues on all traffic crossing their borders or protecting the interests of business within their respective boundaries by means of high license and inspection fees on the products of their neighbors.

Instead of our present unintelligible hodge-podge of nations, states, provinces, counties, townships, school districts and the like, the Technate of North America would be subdivided into administrative areas by means of our present scientific system of universal longitude and latitude. This system offers us a simple and accurate method of blocking off the entire Continent by using consecutive parallels of latitude and consecutive meridians of longitude. The resultant quadrangles (which we will call Regional Divisions) would be designed and located by combining the numbers of the latitude and longitude at the point of the southeast corner of each quadrangle. Thus the Regional Division in which Vancouver is located is 12349; Calgary, 11451; Winnipeg, 9749; Toronto, 7943; New York, 7340; Chicago, 8741; Los Angeles, 11834; Mexico City, 9919; Honolulu, 15721; etc.

With the removal of our present political boundaries, the interference factors which they represent in our social operation would also be removed. Every socially useful function could be united, on a Continental scale, under one head, in a vertical alignment with full freedom to

(*Continued on page* 35)

OBSERVATION - STUDY - ANALYSIS - REPORT.

RESEARCH BULLETIN

APRIL, 1946 Compiled by Editorial Staff No. 39

Power Saws--Past, Present and Future

I SUPPOSE that ever since men first developed callouses on their hands from swinging a falling-axe, and curvature of the spine from bending over a falling-saw, they have thought and schemed on some method of applying power, other than human power, to the falling and bucking of timber.

Throughout the first 35 years of this century, we saw mechanical means applied successfully to almost every phase of logging, other than the falling and bucking of timber. High-lead yarders, skidders and tractors took the place of the bull-team, the railroad and the truck road replaced the skid-road and the chute, but by the start of the year 1936 we had still been unable to mechanize economically and efficiently the felling and bucking of timber in the Douglas Fir Region.

Many men in many parts of the world had worked on the problem of mechanical falling and bucking for at least 40 years prior to 1936. I saw the patent papers of one sawing chain and frame, designed for the falling and bucking of timber by a gentleman in Oregon in 1897.

Shortage of labor during World War I added impetus to the

development of power saw ideas. A wire-rope tree-feller which cut through the tree by heat of friction as it was drawn rapidly past the wood was tried out. A rope saw was developed, consisting of a spiral, fluted, two-way cutting steel rope. It was attached to cables from a double-drum winch. The rope was run rapidly from one drum to the other, cutting the tree in passing.

A red-hot electrically charged wire was tried out to fall trees by burning through the wood.

A device consisting of a series of augurs which could cut into a tree below ground level, thus eliminating the obstacle of the stump, was at least discussed, if not developed.

A power feller was developed using a long roller, equipped with cutting teeth, mounted on the end of a driven shaft. It could swing in a horizontal arc, and could cut its way through a tree.

Many types of circular saws for timber felling were invented. The Russians designed an electric circular saw for this purpose. The French manufactured a circular saw for timber falling which was mounted on the front of a carriage. The saw was electrically powered, but the carriage had to be moved by hand from place to place.

A steam driven drag-saw for falling and bucking was manufactured in England. The boiler was mounted on wheels, and was driven by horses, while the saw portion was carried by hand. The tree feller alone weighed about 600 pounds without including the boiler or the bucking outfit.

None of these devices was even remotely practical for use in the Douglas Fir Region.

Between 1930 and 1935 several types of portable chain saws, powered by high-speed, two-cycle gas motors were tried out in England, Germany, Russia, and the United States, and were apparently a failure due to their light construction and motor failures on test.

Throughout the depression years there was plenty of hand labor available for the falling and bucking of timber here, but by the year 1936 we were beginning to notice that, as our old experienced hand fallers were dying off, or wearing out and dropping away to

lighter work, their places were no longer being readily filled by young men. The young men coming up were more interested in work with machines, than in the hard physical labor of hand falling and bucking. In addition, the average man-day cut of our fallers was steadily dropping, due to the fact that our average timber size was decreasing and our ground conditions were becoming more difficult as we went farther and farther back into the hills for smaller timber.

Someone had to develop a practical power saw pretty soon, if we were to keep supplied with felled and bucked timber to log, keep our falling and bucking costs down to a reasonable figure, and increase the average man-day cuts of our fallers.

Various plans were suggested by various groups in the logging industry for developing a practical power saw. Many of them hinged on the idea of raising a fund to hire the best mechanical brains available to design a suitable machine.

Our own company felt that here, now, was a job for a logger, not for a mechanical engineer. Many designers and mechanical engineers had already had their fling at power saws in the past, and still we had no satisfactory machine. We felt that the best way to beat the problem was to take advantage of all development work which had been done to date, then choose the most highly developed and most suitable machine we could get to start with, work it in our woods, treat it rough, repair it, redesign it and rebuild it as the need was shown by actually working the machine. It would seem that, by this process of elimination of the 'bugs' as they showed up, a satisfactory machine would eventually be developed. We felt that the solution of the probelm of developing a suitable power saw for use in the Douglas Fir Region was about 90 percent application of a power saw to a tree, and maybe ten percent mechanical horse-sense. So we went to work on our own hook.

By the year 1936, out of the welter of types and designs and dreams of portable machines to take the place of the little man's muscles for cutting the big tree, emerged two definite types of machines which alone showed signs of promise of development

into practical power saws — these were the drag saw and the chain saw.

Drag saws were being used successfully for falling and bucking timber in the Redwoods at that time, but the Redwood fallers would often cut only one, or maybe two, of those big trees in a day. Accordingly, they could well afford to spend an hour or so building a platform and making other preparations for setting up for falling their heavy, cumbersome, and relatively slow-cutting drag saws.

Here on Vancouver Island, our fallers would often cut 40 to 50 trees per day. That works out to an average of about 15 minutes per tree. So we had to have a machine which could be quickly carried by two men from tree to tree, which required no spring-boards or elaborate setting-up apparatus, but which could be put to work sawing as soon as the fallers arrived at the tree to be felled. The drag-saw was not the answer to the B.C. loggers' prayer. The chain saw showed more promise.

After some thorough investigation of many types of chain saws, and some trial and error, we tried out a lone German power saw, the Stihl, which had been submitted by a German manufacturers' agent to the B.C. Loggers' Association. It showed far more promise than any other machine which we had investigated or tried out. So the Stihl power saw became the object of our affections.

In the first six months of so-called operation of this machine, I think we may, between breakdowns, have operated it a total of five or six weeks. The rest of the time was spent in repairing and rebuilding it.

We were very fortunate in choosing two men to work the machine who took a real interest in it. The reaction of the rest of our crews was a mixture of well-concealed interest, and of ill-concealed scorn. I well remember one of our old-timers who wandered through one day to where the power saw was working, and having the usual difficulties. He watched the performance for a while, then, as he turned away, 'Ptui!' he said, 'I could cut more timber with a crosscut saw, in a half a day, with one hand tied behind my back than that — — rig can cut in a week.'

Finally, through a period of close co-operation with the factory in Germany, we got machines built by them incorporating the features which we had found from that first machine to be necessary for a power saw to be used in our country.

The German machines had just been brought to a fair stage of efficiency, when along came the War. The source of supply of machines and parts was cut off. We had to turn to and have all parts of our machines custom-built in Vancouver. That was a headache. Incidentally, we are still using a few of those original German machines, as spares, but are fast replacing them with power saws made here in Vancouver.

After the start of the War, a few Canadian and American manufacturers gradually began to take a part in manufacturing power saws here on this continent. The Reed-Prentice Corporation of Worcester, Mass., stepped into the picture here in Vancouver and built several different types of power saws, succeeding the D. J. Smith Equipment Company. They in turn were succeeded by Industrial Engineering Ltd., Spear and Jackson Ltd., of Vancouver. The Shade Engineering Works Ltd., in Vancouver manufactured some custom-built lightweight falling power saws and some one-man bucking power saws for us, using Villiers motors. Burnett Power Saws and Engineering Company succeeded the Shade firm and are manufacturing the same line of power saws, as well as the standard falling machine. Henry Disston and Sons of Philadelphia manufactured several types of power saws in fairly large quantities for the U.S. Army, and are now in civilian production. Mall Tool Company of Chicago have stepped into the gas-saw field, as have Lombard in New York and Hornet Industries in Ontario. All the above manufacture gasoline powered portable chain saws, some of them electric and pneumatic saws as well. E. C. Atkins have their Atkins-Hassler electric tree feller on the market. There are probably other manufacturers of power chain saws on this continent whom I have either not heard about, or have neglected to mention.

The choice of power saws now available is fairly large. I am not in a position here to discuss the merits and demerits of the

various manufacturers' products. We ourselves use two sizes of falling machines, one for average to large timber, and one for small timber, also some one-man bucking machines. All three types of our machines are powered with English Villiers motors, and are made here in Vancouver. We think they are good machines.

As many of you are no doubt aware, with power saws you have a materials and maintenance cost which does not hold with hand falling. With power saws you will invest more money in equipment and materials and less money in payrolls than is the case with hand falling. Your power saws pay dividends when they are cutting timber, not when they are idle, so the general idea in power saw operation is to have the necessary organization, either large or small, of materials and men to ensure that your crews are sawing wood steadily.

We think that sufficient of the proper replacement parts, a few spare machines, proper repair facilities, properly trained mechanics, chain-filers, machine operators, hand fallers, bullbuckers, etc. and standardization on the best type and make of power saw available for simplification of maintenance, are the prime essentials of successful power saw operation.

It looks very much to me as if the power chain saw is here to stay. The advantages of power saws, to our knowledge, are briefly these:

Power saws will increase the average man-day cut of hand fallers by at least 33 1/3 percent.

They will accordingly decrease the number of fallers required in an operation by 33 1/3 percent at least.

They will decrease the Workmen's Compensation levies of an operation by 33 1/3 percent of 11 percent of hand fallers' payroll.

They will reduce accidents to fallers and buckers by 40 percent (according to our analysis of accidents kept for the two years of 1939 and 1940, at a time when we were still using some hand fallers. Power saws .691 men per million feet, hand fallers 1.117 men per million feet, 290 million feet 60 million hand, 230 million power).

They will increase the useful life of our fallers and buckers and make their work easier.

The ability of power saws to fall timber faster than hand methods means a reduction in felled and bucked timber inventories kept on the ground ahead of the yarders. This results in a savings of fire insurance premiums, decreased sap-worm damage to timber, savings in interest in capital invested in felled and bucked timber inventories.

With power saws it is possible to add a young man, as a power saw operator, after a short preliminary training, to every three men now hand falling. This means that it is actually possible to increase any existing supply of hand fallers by one-third in short order. Young men of today will make a trade of power-saw falling where they will not even consider hand-falling.

During the crucial war years, when falling and bucking labor was very scarce, our own company actually added to the supply of trained fallers available over 200 power saw operators whom we trained from scratch ourselves. Of course a good many of these men drifted eventually to other outfits using power saws.

Our company feels that, had we not had our power saw organization established during those war years, and had of necessity depended on the shrinking supply of hand fallers available, for felled and bucked timber, our log production would have been drastically curtailed, if not cut in half. There is also the fact that, without power saws during those war years, we would have had to reach out for part of the reduced supply of hand fallers available to other operators not using power saws.

Power saw falling results in stumps which average 18 inches lower than hand falling. This facilitates yarding and results in considerably more recovery from our cruises. According to our good friends, the mill men, the added 18 inches of timber recovered from our stumps is valueless, twisty and cross-grained, etc., but that is a question that in my mind is open to argument.

Now that the War is over, we will probably see rapid advances in improvements in power saws. Of primary benefit will be a decided reduction in weight, coupled with a probable increase in power. Reduction in weight will be made possible by the use of magnesium, which is now plentifully available, and for which an effective method of welding has only recently been developed.

The advances made during the War in developing 90 to 110 octane gasoline will make possible the use of smaller motors for power saws, which will develop more power than the larger, heavier motors we are using today.

Sawing chains will be improved in design and durability. Cutting speed of our present chains is fast enough, but initial cost and chain life leave room for considerable improvement.

The use of one-man power bucking saws will be rapidly extended, as more competition enters the labor market, and as more skilled operators continue to develop.

EDITOR'S NOTE: *The above is condensed from an address delivered by J. W. Challanger, falling and bucking supervisor, Bloedel, Stewart and Welch, at the 3rd Annual Convention of the Truck Loggers' Association, Vancouver, B.C., Jan.* 1946.

Bursting the Uranium Atom

THE possibilities of the release of atomic energy have been known to physicists for some time. The first indications came shortly after the discovery of radium, when Curie found that it generates heat and maintains itself at a temperature some degrees above its surroundings. The source of this heat energy was investigated by Rutherford during his researches at McGill University in the early years of this century when he showed that new kinds of rays were emitted from radium and a few other similar materials. These rays come from the innermost part of the radium atom which is called its nucleus.

In 1919, Rutherford went further and showed that the nucleus of an atom could be made to emit rays by artificial means, releasing energy in the process. In this process, the atomic nucleus expels a small part of itself as a projectile of very high velocity. This is called the artificial transmutation of an atom, because the loss of the small part changes its nature.

During succeeding years, many new methods of disrupting the nucleus were discovered. Among the most powerful was the

use of neutrons, a projectile discovered by Chadwick in 1932. A neutron is actually a part of the nucleus of an atom which may be ejected when the atom is transmuted. A neutron expelled from one atom eventually collides with and enters the nucleus of another atom, often producing a transmutation of the second atom.

In these early experiments, the atomic energy was released from single atoms at a time and required special and delicate apparatus for its detection. It was not until 1939 that the discovery of 'fission,' or bursting of uranium atoms, gave the first hope that it might be possible to release atomic energy on a large scale capable of military and industrial applications. Physicists and chemists in various laboratories throughout the world had been trying to understand the behaviour of the heavy element uranium when it is exposed to neutron rays. Gradually, bit by bit, with careful experimenting they found the explanation. They discovered that the rays caused the uranium atom to split in two. They found that this bursting, or 'fission' as it is called, of a uranium atom was over ten million times more violent than the bursting of a molecule of a modern high explosive.

The bursting of a molecule of high explosive is a chemical process —one of the many chemical processes that are familiar to us, like the rusting of iron and the burning of coal. These processes are brought about by the forces **between atoms** which are called chemical forces. The bursting of the uranium atom, on the other hand, is caused by forces **inside the atomic nucleus**, forces enormously stronger than the chemical forces between atoms.

The fission of uranium differs from ordinary atomic transmutation processes. Transmutation involves the ejection of a relatively small part of the atomic nucleus, such as a neutron or an electron. The loss of this part alters the properties of the atom, including its chemical behaviour. In the case of fission, however, the uranium atom splits into two large parts which become two new atoms of chemically different elements, a discovery so surprising that the scientists feared that no one would believe it.

In addition, the fission of a uranium atom is accompanied by the expulsion of neutrons. The number of neutrons emitted varies,

but lies between one and three. This is a fact of the greatest importance, for it opens up the possibility that the same process of fission can be propagated in neighbouring atoms of uranium. Another important respect in which fission differs from transmutation is that the energy released in the process is many times greater.

The entry of a neutron into the nucleus of the uranium atom is the trigger which sets off the fission process. Since neutrons are also emitted in fission, they are available to act as the triggers for the fission of still other uranium atoms, and thus under favourable conditions, whole chains of fissions can be produced, each fission being caused by a neutron released in a previous fission.

In this way the process can be made self-propagating and self-increasing so that what starts as an action affecting only one or two atoms may, in a short time, affect a large proportion of the atoms in a block of material. In other words, a 'chain reaction' is set up. These are the conditions which must be realized if the energy released in these nuclear processes is to be made available on a large scale. If the chain reaction builds up very quickly the energy will be released in a violent explosion as in a bomb; when the chain reaction is controlled the energy may be set free at a steady rate.

The large scale release of atomic energy depends entirely on the conservation of the neutrons produced, in order that they can cause still further fissions. If the supply of neutrons is dissipated by losses, the combustion of uranium will die out like a fire that lacks air. Losses of neutrons can occur in many ways. Some of them merely escape from the uranium to the outside; others may be absorbed in the uranium itself or in foreign substances. All materials absorb neutrons. Any substance which is present with the uranium competes with it for the available supply of these particles.

Even in uranium itself not all the neutrons absorbed produce fission. In ordinary uranium, as it occurs in nature, there are three kinds of uranium atom which are distinguished by the names U238, U235 and U234 atoms. They have been so named because they are respectively 238, 235 and 234 times as heavy as the lightest kind of atom, hydrogen. Almost all of the fission occurs in the U235 atoms but these are only 7/10 percent of the mixture. The number of U234

atoms is negligibly small. The U238 atoms absorb neutrons freely without producing fission (except to a slight extent when they are struck by neutrons of very high velocity), and unfortunately U238 atoms greatly predominate in natural uranium. In order, therefore, that the reaction shall multiply itself at the greatest possible rate it is necessary to use U235 alone or at least fairly free from admixture with 238.

In a mass of U235, neutrons will be lost mainly by escape into the outer air. The importance of this effect can be reduced by increasing the size of the mass, since the production of neutrons, which is a volume effect, will increase more rapidly with size than the loss by escape, which is a surface effect. It follows that if the explosion is possible it will require at least a minimum mass of material, which is called the critical size. Thus the explosion is very different in its mechanism from the ordinary chemical explosion for it can occur only if the quantity of material is greater than this critical amount. Quantities of the material less than the critical amount are stable and perfectly safe. On the other hand, if the amount of material exceeds the critical value, it is unstable and a reaction will develop and multiply itself with enormous rapidity resulting in an explosion of unprecedented violence. Thus all that is necessary to detonate the bomb is to bring together two pieces of the active material, each less than the critical size, but which when in contact form a mass exceeding it.

The separation of the U235 atoms, which are most useful for fission, from the comparatively inert U238 atoms is extremely difficult. Both kinds are uranium atoms. They have identical chemical properties and, therefore, no chemical procedure can distinguish between them. Physical methods which depend on the very slight difference in weight must be used for their separation, and very great technical difficulties had to be overcome to develop a method which was satisfactory even on a laboratory scale. To do this on the scale required for production of the amounts of material necessary for an atomic bomb was a most formidable task and demanded a great industrial effort. The separation of U235 has however been accomplished in the United States.

Uranium is not the only substance that is capable of fission. Another fissile material is plutonium. This substance does not occur naturally, but must be prepared by exposing uranium to neutrons. The U238 atoms, which contribute very little to the fission of ordinary uranium, are the ones that are transmuted to become eventually atoms of plutonium. Plutonium, like U235, is very fissile, and it has the important advantage that it is chemically different from uranium and is, therefore, easily separated from it by chemical methods.

The plant which is being built near Petawawa to produce materials for release of atomic energy, will contain uranium and heavy water. When these materials are brought together in certain proportions and in sufficient quantity chains of fissions are set up and large quantities of energy are released from the uranium in a controlled and non-explosive way.

The basic process in the Petawawa plant is the production of fission in uranium 235 by a slow neutron. The fission of a U235 atom releases high speed neutrons; these collide with the heavy water molecules without being absorbed and so they lose speed until they in turn produce fission. In this way a slow neutron 'chain reaction' is set up. This results in very large numbers of neutrons being set free. Some of these neutrons are absorbed in the U238 atoms to produce plutonium. Later the uranium can be removed from the plant and the plutonium extracted chemically.

Other neutrons can be absorbed in materials placed round the reacting uranium. By this means interesting new radioactive materials can be produced in large quantities. The plant will, therefore, be a source of supply of such materials for the study of chemical and biological processes and for application in medicine.

Some of the energy of fission is released in the form of fast neutrons and energetic gamma radiation. The reacting uranium must, therefore, be surrounded with a great thickness of material to absorb the neutrons in order to protect the working personnel from injurious effects. The intensity of the fast neutron radiations is much greater than any previously available to physicists and presents great possibilities for scientific research.

The greater part of the energy of fission appears in the form of heat generated in the uranium metal. This heat has to be removed by rapidly flowing water or gas. The metal surface temperatures are too low at present for this heat to be used effectively for the generation of power, but there is a possibility that this limitation may be removed by further work.

The design of uranium fission plants presents technical problems entirely different from anything previously encountered in industrial and engineering experience. It requires the combined knowledge and training of experimental and mathematical physicists, chemists and engineers and experts in other sciences. Every important feature of design has been based on difficult calculation, measurement and experiment. **—Dominion Bureau of Statistics**

Miracle Metals of Tomorrow

THANKS to the war, a century's search has ended, and one result is that, in the near future, we shall have some new miracle metals in everyday use. They will simplify household tasks, promote safety, and bring us various other benefits.

Just over 100 years ago, scientists discovered a new metal which they named beryllium. They found that it was lighter than aluminum, yet stronger than steel. The snag was that it had extreme brittleness, causing it to break when dropped even gently.

For nearly a century, laboratory workers sought to surmount this drawback. They tried combining beryllium with other metals, but the alloy was still so fragile that its use in industry was impossible.

Yet during the last five years beryllium has helped us to win the war. Tomorrow it will bring many peacetime boons.

Impelled to still more searching experiments as a result of wartime necessity, research experts are well on the road to completely mastering beryllium's mysteries. They have found that the secret is to combine a very small amount of it with copper.

The result is an alloy so strong that a rod of it, only half an inch thick, will support 20 tons. Moreover, this alloy does not quickly become fatigued as many other metals do.

The uses to which beryllium can now be put are many. It will help us to achieve greater speeds without sacrificing safety, on land and sea and in the air. It will give longer life and greater strength to vital components.

In the home, it has uses in refrigerators, thermostatic heaters, and vacuum cleaners. Fine-precision instruments, such as those used in surgery, will operate with greater accuracy. They will also serve for a longer time, without losing their precision or breaking down.

Even now, scientists believe they have far from exhausted the peace time possibilities. Already beryllium is being used to give us better television. The screen of many modern receivers is coated with beryllium-oxide, thereby improving the image.

It is further being found advantageous by scientists who are trying to harness the atom and provide a new, limitless source of power.

There are some peculiarities of this metal remaining to be explained, but when these mysteries are solved, still further benefits may be derived. Why, for instance, does a kiln lined with bricks containing beryllium give greater strength to porcelain articles baked therein? That is just one question for which an answer is being sought. The solving of this phenomenon promises to extend the uses of the metal in directions yet unexploited.

Then there's tantalum—so-called because, like beryllium, it presented tantalising problems for many years. But it has now been made to disclose its secrets.

Tantalum can now be drawn to such fineness that wire made from it is almost invisable. It is so hard, however, that a lump of the metal cannot be drilled with an ordinary diamond drill. Only one acid (hydrofluoric) affects tantalum.

This metal is of inestimable value for sewing severed nerves, and has a useful part to play in the making of lenses and special machinery.

It became so useful, during the early stages of the war, that all existing stocks were put under Government control. In the job of rebuilding the world and re-establishing industry, it will be equally valuable. It figures in the production of synthetic rubber, and has immense potential value in electronics.

We'll be hearing more about indium, too. A rarity until 20 years ago, only about 15 lbs. of this particular metal were produced in 1927. Now the world output has soared to thousands of times that weight, and is still rising.

The reason is that many new openings have been found for indium. Because it is practically non-corrosive, it has come into use as a coating for the airscrews of aircraft. It will help to make civilian flying safer, by obviating the need for frequent inspection and replacement of propellers.

Ordinarily, those vital parts of aircraft quickly become rusty, and with the loss of efficiency comes increasing lack of safety. Indium will help to overcome this risk.

It is similarly of great value in preserving the bearings of rapidly-moving parts. Even before the war it was being put to limited use for some civilian purposes, but it was such a comparative rarity that its wider utilization was restricted. Now that war has stepped up the production, scientists are forging ahead with fresh applications.

New aluminum alloys, stronger than any existing a few years ago, have also been perfected. Another innovation is the freezing of metals between heat treatment, a scheme which gives them still greater hardness.

One new aluminum alloy, known as R-303, is the strongest such alloy yet produced. It took laboratory workers two years to perfect this metal, but they finally found that they had got something three times as strong as steel—and non-corroding, too.

Now they aim to harness it to a wide variety of new jobs. It will enable us to have practically indestructible household utensils, and will probably be used for automobiles, furniture, and perhaps even railway sleepers.

Further, there is unlikely to be any shortage. During the last few

years, scientists have shown that aluminum can be manufactured from clay at low cost. They had the process worked out on paper a long time ago, but until they received the war-time call they said that the formula was too costly to carry out.

Today, however, aluminum can be derived from clay on an economic basis. Much of the vast quantities used in aircraft construction have come from that source. Further, the plant for producing this aluminum can shortly be switched over to meet the civilian peace-time demand.

A new era in the history of metals is believed to be opening, and it is an era which promises to bring almost untold benefits to our normal life. **—Arthur Turner in The Vancouver Sun**

★ FELDSPAR is an important rock-forming mineral which has found wide application in Canadian industry. It is used in the process of the manufacture of pottery, glass and enamelware, in the production of scouring soaps and cleaners, and for bonding fired abrasive wheels. Some coarsely crushed spar is sold for stucco dash, artificial stone, chicken grit, etc. Practically all colors are equally acceptable for ceramic uses, but for cleanser purposes pale shades of white buff are used.

In recent years, the entire production of feldspar has come from adjacent sections of western Quebec and eastern Ontario, in the general vicinity of Ottawa. Until 1942, mine output was about equally divided between the two provinces, but in that year Quebec gained a substantial lead and has since supplied 70 to 80 percent of the total. Canada has large reserves of feldspar and production could be increased to meet any likely demand.

World production of crude feldspar in 1937, the latest year for which complete statistics are available, totalled about half a million tons, of which the United States furnished 50 percent. In 1941, production in that country achieved a record of 338,860 long tons valued at $1,519,000, but declined slightly in subsequent years, the estimate for 1944 being 325,000 tons. In 1937, Canada was fifth on the list of world producers, following Sweden, Norway, and Czechoslovakia.

Domestic requirements for feldspar are relatively small, and a considerable part of the annual output of crude spar is exported to grinding mills in the United States. Production of feldspar in Canada in 1944 totalled 23,509 short tons valued at $227,632 as compared with 23,858 short tons worth $237,771 in 1943. Of the 1944 output, 18,000 tons worth $177,000 were shipped from Quebec properties and 6,000 tons valued at $50,000 from quarries in Ontario.

—Dominion Bureau of Statistics

(Continued from page 18)

carry out its function without political or business interference. All functions could be co-ordinated into one single operating mechanism by means of a central control, which would be composed of the operating heads of each sequence of function. The Technate would be a social mechanism operated in complete accord with the dictates of our present day technological developments.

The chart on another page illustrates graphically the main features of such a Continental organization. In the lower half of the chart are shown schematically several Functional Sequences, Industrial Sequences to the left and Service Sequences to the right.

The size of the chart does not allow us to show the total number of Functional Sequences of either group. On a larger chart the additional Functional Sequences would be shown laterally in the same manner as those shown here. Each Functional Sequence would have its own internal organizational chart, which would spread downward in a similar fashion, but that is an elaboration which need not concern us here.

Directly under the Continental Control, as schematically depicted on the chart, are four special Sequences: Armed Forces, Continental Research, Social Relations and Foreign Relations.

Armed Forces (as the name indicates) includes all the land, sea, air and fortifications forces. This Sequence also embraces another and very important function — the entire internal police force of the Continent, a Continental Constabulary. The latter organization has no precedent at the present time. Today the internal police force consists of the familiar conglomeration of city police, county sheriffs, provincial police, state troopers, various denominations of Dominion and Federal agents, and others, many of the former being controlled by local political machines and racketeers. By way of contrast, the Continental Constabulary is a single disciplined body, unified under one jurisdiction.

The Continental Constabulary would be under the discipline of Armed Forces but it would receive its instructions and authorization for specific action from the Area Control, a Sequence we will deal with later, and Social Relations.

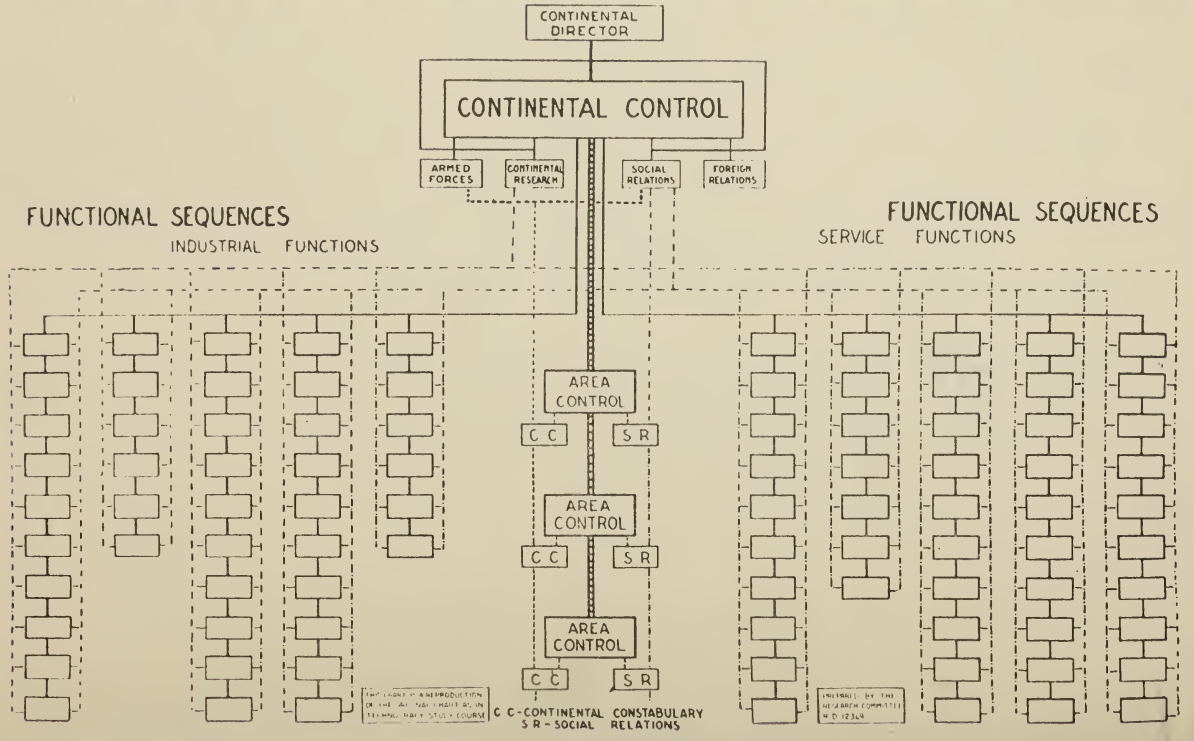
The duty of the Sequence of Social Relations is looking after the 'law and order,' or seeing that everything as regards individual human relations functions smoothly. It would deal with anything from problems of emotional or marital maladjustment to good will tours between communities and sequences. The nearest counterpart to the function performed by Social Relations that we have today is that of the judiciary. Social Relations, however, would not use any of the outworn devices of our present legal profession, such as the sparring of scheming lawyers and the conventional passing of judgment by twelve good men and true.' Instead, problems to be settled would be investigated by the most impersonal and scientific methods available. The duties of Social Relations will already have been greatly simplified with the establishment of a Technate. In a Technocratic administration most of our present concepts of property would disappear, and with them would go litigation over property rights, which engages most of the activities of our present legal profession.

Since the function of Social Relations applies wherever there are people, that Sequence must parallel laterally all other sequences in the social mechanism. This is shown schematically on our chart by means of the broken line.

Another all - pervading Sequence is Continental Research. The primary function of the staffs of the Functional Sequences described hitherto is the maintaining of operation in the currently approved manner. In all Functional Sequences, however, whether Industrial or Service Sequences, it is necessary to maintain a constant and alert research into the development of new processes, equipment and products. There must also be continuous analysis of the data and resources pertaining to the Continent as a whole for the purpose of co-ordinating current activity and for the purpose of charting the depletion or growth of resources in order to determine a long-term policy with regard to their development and use.

The requirements of this job render it necessary that all research in whatever field be done under the jurisdiction of a single research body—Continental Research. This will make all research data available to any re-

SCHEMATIC ADMINISTRATION CHART OF THE AMERICAN TECHNATE



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search investigator wherever and whenever needed. Any innovation in current methods is installed on the basis of its merit as regards the particular sequences concerned and the Continent as a whole. Even the general staff of a particular sequence does not have the power to decide whether a piece of equipment or method should be retained, discarded or altered. Continental Research must first determine the advisability of such a move. It also has the authority to cut in on any operating process for experimental purposes when necessary. In case a new development originates in the operating division, Continental Research must approve it before it can be adopted. Any person having research capabilities may transfer at any time from the operating division of a sequence to the research division, or vice versa. The personnel of Continental Research, like that of any other Sequence, advance on a basis of ability and pyramid to the Director of the Sequence.

The jurisdiction of the Sequence of Foreign Relations covers all dealings of any nature by any Sequence of the North American Technate with the rest of the world.

The Area Control, which was mentioned previously, is the co-ordinating body for the various Functional Sequences and social units operating in any one geographical area of one or more Regional Divisions. The geographical location, the size of the population, and the number and type of Functional Sequences necessitating closer unity and co-ordination would determine the size of the area under the jurisdiction of each Area Control. The Area Control operates directly under the Continental Control.

Due to the fact that the age for retirement of the working population is 45 years, a person would have to be exceptionally capable to hold a position on the Continental Control for more than his allotted length of time. There is therefore no likelihood of the system crystallizing due to lack of turnover of personnel.

A social system such as we have just described is merely an extension of the design for any functional organization which we have today. There are numerous operating examples of such organizations. One of the largest, and one which serves every one of us directly or indirectly, is that of

our mail delivery system. The relationships which exist in its internal structure will undoubtedly apply in a similar manner to those of the Continental organization we are contemplating. A brief examination of the Canadian Postal Department will show this to be the case.

At the head of the Postal Department is the Postmaster General and the Deputy Postmaster General. Next below them are the department heads of the various department branches — the General Superintendent of Postal Services and Assistant Deputy Postmaster General, the Director of Administrative Service, the Superintendent of the Financial Branch, the Director of the Public Relations Branch, the Superintendent of the Equipment and Supply Branch, and the Mechanical Engineer. The Postal Service Branch is subdivided under the Chief Superintendent of Post Office Service, the Chief Superintendent of Railway Mail Service, the Chief Superintendent of Air and Land Service, and the Chief Inspector.

This superstructure supervises all activity pertaining to the handling of our daily mail. All branches function through their counterparts in the District Postal Offices. There are 15 of these Postal Districts in Canada, each one headed by a District Director. Under the District Director come all post offices and postmasters in his District. On his immediate staff are the Superintendent of Mails, the Superintendent of Investigations, the Superintendent of Mail Services, the Superintendent of Administration, and the Inspector of Railway Mail Service.

The structure could be further subdivided to show that every function in the entire system has a definite position in the vertical alignment of the whole operation. If any one of the functions ceases to operate as it should, the entire structure suffers in direct proportion to the importance of the function. That somehow or other the right man must have been placed in the right job is sufficiently attested by the fact that the system works. The fact that mail can be sent to, or received from, any part of the country in a matter of a day or two is ample evidence that the individuals in whatever capacity in the functional operation of the mail delivery system must be competent to handle their jobs. In all proba-

bility you would not be reading this magazine today without the co-operation and function of our Postal Department.

It is significant to note that nowhere in the entire structure of our Postal Department does anything like a political election take place. The fitting of a man to his job takes place in exactly the same manner as we have indicated in describing the Technocratic administration. All vacancies are filled by appointment from above on a basis of ability determined by examinations and record of function. This appointive system pyramids on up through the ranks of all functional sub-divisions of the entire Postal Department. The Postmaster General receives his title by appointment. His case, however, differs from that of any of the others in that he is merely the political figurehead of the Department, appointed to his position by the Prime Minister. The man who has risen through the ranks and supervises the functional operation of the Department is the Deputy Postmaster General. He is the operational head of our Postal Department and knows more about the function of our mail delivery system than any other man.

It is of some consequence to observe that although this method of choosing the right man for the right job is anything but democratic (in the orthodox political sense), it elicits no objections from the men in the Department or from the public which it serves. There are no cries of 'dictatorship.' There are no demands for a 'right to vote.' The men in the Department are too busy functioning at their appointed jobs to give the matter much thought. If they do stop to think about it, they will no doubt come to the realization that the Department could not possibly operate any other way than along its present lines if it is to efficiently perform its required task. The public in general just take the Postal Department for granted. All they are concerned with is the receipt and delivery of their mail on schedule. They do not know or care how it is done as long as it it done. If their magazine or letter arrives a day late, they may grouse and grumble, but they seem to realize that holding an election to select a new mailman won't contribute toward improving the mail service. Such tactics

would tend to hinder and interfere more than to assist and improve functional operation.

Another important characteristic concerning such a functional organization which we can point out at this time is the fact that it is continually changing and being remoulded by the requirements of the job in hand, calling for the adoption of new methods and the installation of better equipment. The Postal Department in Canada stems from the creation in England, about the year 1512, of the first 'master of posts' for the conveyance of state documents by court couriers. This expanded to take in the carrying of letters of business and private correspondence. Mail service came to Canada with the early explorers and traders. Since then it has grown with the population and industrial expansion of the country until today it is a 44 million dollar business with over 12,000 fully staffed and equipped post offices. Equipment is added as the need for it arises. There is no need for 'dictatorship' or for the expression of opinions to determine whether or not a new method or piece of equipment should be installed. The requirements of the job will determine such decisions. Argument or debate on whether or not the pony express should be eliminated in favor of the railway mail car would have had little moment in the final decision. Physical conditions decided in favor of the railway mail car. It fulfilled the requirements of carrying more mail, farther and faster.

Such are some of the basic properties of any competent functional organization, and judging from the number of people working quietly within such organizations, it must also be in accord with the biological nature of the human animal.

The Technate of North America would be a union of all the operations in this geographical Area into one functional organization with complete authority to plan and direct these operations. It is designed along lines that are incorporated into all functional organizations that exist at the present time. Its membership would comprise the population of the North American Continent. Its physical assets with which to operate would consist of all the resources and equipment of the same Area.

Such an organization has no precedence in any of the political

forms. It is neither a democracy, an aristocracy, a plutocracy, a dictatorship, nor any of the other familiar political forms, all of which are completely inadequate and incompetent to handle the job. It is, instead, a **Technocracy,** being built along the lines of the technological job in hand—the efficient and harmonious integration of a Continental factory for the production and distribution of abundance to the entire population. **—C. A. Norberg**

★ NEPHELINE SYENITE is essentially a substitute for feldspar and continues to be used chiefly in the glass trade. Most Canadian glass companies, and several large American plants now use the material. Some feldspar grinding plants in the United States use the syenite for blending with their granular glass spar. Research has been proceeding steadily on applications for nepheline syenite in other branches of ceramics. It is used as an ingredient in the manufacture of a variety of other products including pottery, semi-vitreous ware, sanitary and electrical porcelain, floor and wall tile, and structural clay products, as well as in enamels. Because of its relatively high alumina content, nepheline syenite has attracted attention as a possible source of pure alumina for the production of aluminium, to replace bauxite, and commercial methods of treatment have been worked out.

The developed occurrences of nepheline syenite in Canada are confined to Ontario, where deposits have been worked in Peterborough, Hastings, and Haliburton counties. The large operation at Blue Mountain, Peterborough country, has accounted for most of the output and has been the only producer since 1942. Prior to that year small tonnages were produced intermittently from deposits near Bancroft, in Hastings county, and near Gooderham, in Haliburton county, and the material was shipped in the crude state to grinding mills in the United States. Other known, but undeveloped, occurrences in Ontario are in the French River area, Georgian Bay district, and at Port Coldwell, Thunder Bay district, on the north shore of Lake Superior. In British Columbia, there are extensive bodies in the Ice River district, near Field.

Canada and Russia are the only countries that are known to produce nepheline syenite on a commercial scale. Canadian reserves are large, and production can be increased greatly if necessary. Producers' sales of nepheline syenite in Canada in 1944 were valued at $218,000 compared with $292,000 in 1943, and $37,000 in 1936, according to records maintained by the Dominion Bureau of Statistics.

—Dominion Bureau of Statistics

★ THE SPECTER OF POVERTY in the midst of plenty has plagued the vision of America since the depression days when cotton rotted on the wharves while unemployed shivered on the streets. Now we face, again, a situation of so-called 'over-production.'

In theoretical economic terms 'over-production' may have some meaning; in human terms it can have none. We have learned from the war economy that the wealth of the country is not measured by money but by machines and men.

—Common Sense

Are We Controlled By Credulity?

The credulity which has been handed down from the ages when our forefathers trembled in caves at the mysterious events of the natural world has made us the slaves of those who have learned to play upon the fears of others for their own personal gain.

MOST human beings resent being called cowards. Nevertheless, this resentment is but the reaction to a hurt ego. We might fail to realize the extent of our fears or their real nature but, by and large, we are all afraid of something.

One most common fear is that of being considered different from the herd. Another is that of death. Still another is that of insecurity. Some folk are so permanently scared that they will try anything, no matter how absurd, which appears to offer protection. Hence the vast numbers who experiment with 'fear-cures' varying from monkey glands to ectoplasm, teacup readings to miraculous intervention, metaphysics to economics.

The majority of human beings demonstrate their possession of fears openly. Just watch them as they pass you by. If their eyes shine with the joy of just being alive, if their behaviour is carefree, happy and contented, if they smile and laugh easily and naturally, the likelihood of their fears being relatively few is high.

The gloomier they look, the more furtively they act, the less happy, contented and cheerful they appear, obviously the more fears they have. Note how remarkably few can be placed in the first group. Remember that nobody is an expert at diagnosing the real behavior of others at a mere glance and that the practice of dissembling in public is early taught and readily acquired. The general condition of mental fear among the human race will then be obvious.

It has been said that if one wants to arrive at intelligible issues—not to say conclusions—in any discussion, one should begin by settling the meaning of the terms about to be used. The term 'fear' must, therefore, be objectively clarified. It is the state of mind, terror confused, created by the threats inherent in human speech and thought, to

which the term 'fear' is herein applied.

We omit 'the avoidance of unfamiliar phenomena till proof that the particular phenomenon is not physically harmful,' which is common to all living things to some degree. An amoeba, it is asserted, will avoid a drop of acid in the water wherein it swims. Any living cell will resent intrusion, actual or attempted, by any other form of life. It is probable that any living creature will avoid, where possible, any action which it is already aware will produce either physical pain or unpleasant sensations. These behavior patterns are not symptoms of fear. They are more correctly classified as 'self preservation.'

The human baby behaves like any other form of life at first. It, too, avoids unfamiliar phenomena, where possible, till the particular phenomenon is found harmless. It evades, where possible, physical pain or unpleasant sensations. It is not till it becomes cognizant of human speech that fear is actually inculcated into its mind.

As one learns to understand the sounds made by one's parents and neighbours, there is created in the human mind the beginning of a long series of 'bogies' or 'demons,' whose capacity to hurt, the human being is constrained to believe, is far greater than that of any earthly thing which the particular human has ever encountered.

The inhibitions placed by parents or other adults on a child's 'free-speech' soon forces the child into silent vocalization or thinking. As soon as this is apparent, the child is normally assured that sinful thoughts are even more wicked than sinful sonant speech. Few of us, even in adult life, let alone childhood, ever learn to control our thoughts and, in consequence, most adults and all children suffer agonies of remorse and fear due to wayward thoughts which have filtered through their minds, or dreams which have come to them unaware in the night. Thus our fears follow us through all the waking hours and form a very substantial part of our dreams, eventually coming to be deeply engrained in all our mental processes.

The use of fear ideas as a method of enforcing parental or authoritarian obedience as well as in training children in the local social taboos is practically uni-

versal. The bogies of bad-men, bad-women, wolves, bears, tigers and myriads of others swarm throughout literature and are an integral part of the normal home curriculum. This use of fear as a deterrent is both a common and insensate practice. Whippings, deprivations and irate scoldings are among the more usual parental methods of obtaining so-called discipline. Parents rarely comprehend what incalculable damage they inflict thoughtlessly on their offspring.

It is only natural, however, that this should be so. Similar methods are used against the parents by those in authority over them. Jail sentences, fines, floggings, concentration camps, wars and even atomic bombs are just a few adult specimens of obtaining questionable ends by the use of terror. Fear of all that is new, strange, unorthodox, not traditional, unknown to our forefathers or objectionable to the present holders of the vested interests is the accepted and heaven-blessed way of maintaining the status quo. Great indeed are the blessings of democracy. Under its assumed benign sway, our rulers and our parents govern and enforce obedience by the frank use of fear, concealed or open.

This constant repetition of fears from childhood onward until we die, produces in all of us deep channelizations of the fear complexes. These channelizations do not necessarily respond to the original sensory activations nor do they produce the original behavior pattern. Even from the start, they often respond to other sensations and produce wholly unexpected and quite different final results. The original cause of any fear channelization may be buried and forgotten but the effect stays with us and colors our lives. This last war has forced some of our leading psychiatrists to a realization of this fact. One of them has had the courage to proclaim it publicly to a degree.

Fear, however small or great, whether it be connected with speech or thought, rapidly leads to 'rationalization.' We could not live in any comfort or ease if we did not do something to inhibit, tame down or whitewash these constant fears of ours. Naked and grinning, they are usually too much for our nervous systems. As it is, many fall ill and others are driven eventually to the lunatic asylum from this cause.

When once they are clothed

and masked, we can tolerate our fears and even adapt ourselves to the point where we actually like some of them. In consequence, at a very early stage, we begin to seek excuses, alibis and explanations, designed by human beings, to enable human beings to be less afraid of the numerous spooks and bogies with which human speech has haunted human minds. Somewhere in the primitive eras of man's progression, 'free enterprise' started the biggest and most profitable business of any that exist today. This is the business of providing the necessary excuses, alibis and explanations enabling man to clothe and mask his fears.

As a result, in Canada and the U.S.A., despite our so-called scientific age (and our claim to most of the scientists and technicians), it is a matter of sober and incontrovertible fact that the minds of the great majority of the citizenry are filled to overflowing with false inferences, illusions, hallucinations, unsatisfied yearnings, unadjusted tensions, faiths, b e l i e f s, ungrounded assumptions, nebular hypotheses, wild theories, lopsided ideas and cockeyed concepts.

No one in America, north of the Rio Grande, need go any farther afield to study such quaint human behavior patterns as are embodied in ancestor worship, idolatry, fetishes, medicine bags, ghosts, fortune tellers, astrologers, gods, devils and other means by which the human race is forever hoping to rationalize its uncomprehended fears. We can find practically all of these right in our home town and quite probably in our own street.

Rationalization, which may be a strange word to some, is the act of explaining to ourselves something that is otherwise comparatively incomprehensible to our meagre understanding. For instance, we can rationalize a rainbow as being a sign placed in the sky by some anthropomorphic being to reassure us against the return of a world-wide flood. Torquemada of Spain, a noble Christian gentleman, rationalized the burning at the stake of those with whom he disagreed spiritually as 'saving their souls from hell-fire.' The peoples of Europe, at the time of the Reformation, regardless of religious affiliations, rationalized infectious diseases such as diphtheria, typhus or cholera as 'visitations from God to punish us for our sins.' The

more ignorant we are, the less we understand what word symbols represent, the less we comprehend the measurable happenings and occurrences around us, the less we know as to the reasons for our mental unease, the more we seek to explain away these things by some argument which will sound convincing and satisfying to our peculiar mentality.

It matters little whether we rationalize by the very complicated means of metaphysics, psuedo science, philosophy, dialectics, religion or any of the 'higher' and therefore purer forms, or whether, like the farmer who viewed the giraffe for the first time, we say 'there ain't no sich animile' and leave it at that. Whichever way happens to suit our own personal and peculiar processes, explain away the mystery for us, assuage our fears and give us some semblance of ease instead of disease, is clearly the one most suited to our individual needs.

Each of us is an individual. In each of us, the reaction to our childhood training, our adolescent training and our adult training has been different, due to the peculiar individualism of our protoplasm. One of our most common obsessions, however, is that our particular rationalization is automatically the ideal one for the entire human race. The practice of forcing our opinions and beliefs on others, often with violence and mayhem, needs no examples. History is full of them. The Allied behavior pattern in Europe and Japan is a modern example. The 'accept Mohammed as the Prophet or die' of the militant Moslem is of the same form of paranoia as that exhibited by our leaders in regard to democracy and the 'American way of life.'

The pastime of 'kidding ourselves into believing that our fears are groundless' is a very ancient one. The Australian aborigine does it. So did the Samarians and the Egyptians. Most probably Neanderthal man did it too. Perhaps it goes even farther back than that—but it goes no further back than intelligible speech. An ape would scorn such foolishness, not because he knows better, but merely because he is not equipped to be so inane.

This 'hand-me-down' from the days when our forefathers shivered in dank caves in fear and trembling at, what were to them, the very mysterious and horrify-

ing incidents of the natural world around them, has bred in man the bestial cruelty and love of destruction which is exemplified today by the furnaces of Belsen and the destruction at Nagasaki. It has made us slaves of those who have learned during the course of centuries to play upon the fears of others for their own personal gain and profit. It is responsible, almost entirely, for the barbaric and species-destroying custom by which man enslaves, brutalizes and kills his fellow-man.

Perhaps a million or much fewer years ago, man first acquired the bright idea of letting someone else do his thinking for him. Once that idea got started, it grew and grew until, today, the majority of the human race either cannot or dare not think for themselves. Never, even in the palmy days for superstitions, such as existed in Thebes or Babylon, Cuzco or Athens, Rome or Chi-chen-itza, was there such a galaxy of institutions designed to explain away the fears of mankind. If we desire to have a thought concerning any subject, from any angle, or for any purpose, there is at our disposal a multitude of agencies, willing and eager to supply it. All they ask in return is a donation, commensurate to those who desire to live, not by the sweat of their brows, but by the credulity and faith of their fellow men.

It takes great courage to think for oneself, even in minor matters, in this twentieth century. Genuine freethinkers are as rare as are genuine scientists. It takes great mental fortitude to be a doubter and to question the glib assurances, the canned opinions, the quick-frozen thought as supplied by the numerous businesses dealing in ready made rationalizations.

Admittedly real freethinking is, perhaps, less physically perilous than it was three hundred years ago. That, however, depends on how minatory the doubter is to the holders of the vested interests. He is still in peril of becoming a social outcast, accused of being a moral leper and likely to suffer grave economic pressure. If this is doubted, try telling the government publicly that the practice of kissing the Bible in our law-courts is a fatuous, fallacious and wholly unsanitary habit. Note the wrath one will create. Anyone with integrity of thought knows, of course, that if neither oath nor kissing were used, the resultant

perjury would be approximately the same. Is it not known that the truth is that which is used when a lie will not do?

It is impossible to write a strictly factual textbook on any subject for the use of the children of the schools of Canada or the U.S.A. that would not offend the business interests, the political parties, the various societies and groups who incessantly lobby in the press, over the radio, from the pulpits or the rostrums and in the legislatures, ever seeking to maintain the credulity of the populace in regard to some rationalization or other, specific to the particular group. If, for instance, one were to state in a school textbook that memorials to the gallant dead of this and past wars, the memorial services, the wreaths, the pious platitudes, the perjured promises made to the survivors were nothing but foul-smelling hypocrisies and if one were to add that a reasonable allowance for food, shelter, clothing and amusement given to the survivors and the families of those who died would be more sensible, one would arouse an antagonism almost as great as one would provoke in Mecca by spitting on the Kasbah stone. Does it actually hurt to spit on a meteor? Is it ever safe to speak the plain unvarnished truth? Certainly not if we are afraid of meteors or the dead. We are civilised but we are afraid of ghosts. We must honor them in the traditional manner lest they be offended. Of such dementias are our modern and up-to-date rationalizations to which we bow the knee, as maudlin as a Hottentot before his fetish or any ignorant savage kowtowing to his local spook.

Speech was and still is a miraculous performance. Deeds may kill a single rabbit but oratory can make that kill into a herd of mammoths. Fear enabled the man of words to have ever increasing power over others. There is no doubt that the dictators of the human race have all been fluent emotional speakers, who realised how credulous their fellows were and used that credulity for their own ends. Emotionally charged oratory is as potent now as it ever was. Not until the individual man realizes his own strength and grasps the essential weakness of those who control him through fear, will he learn to free himself from bondage.

—G. D. Koe

(Continued next month)

Notes on Organization

★ CONTINUING with Tour No. 11 of A. A. Milligan:

Brandon, March 16, 17, 18; Public Meeting, 18.

Winnipeg, March 19, 20, 21, 22, 23, 24, 25; Public Meeting, Auditorium Concert Hall, 19; Canadian Association of Power Engineers, 20; Public Meeting, Section Headquarters, 21.

Flin Flon, March 27, 28; Public Meetings both evenings.

Fort William, March 31, April 1, 2, 3; Public Meeting, 2; Membership Meeting, 3.

Sudbury, April 5, 6, 7.

Toronto, April 8, 9.

Hamilton, April 10, 11.

Authorized Speaker Milligan will also deliver public lectures at *Windsor, St. Thomas, London, Kitchener, Owen Sound, Peterborough, Kingston, Brockville, Ottawa* and *Montreal.*

For details on Ontario points contact the local Section of Technocracy Inc. or write to Section 1, R.D. 7943, Technocracy Inc., 421 Yonge St., Toronto 1, Ontario.

★ AUTHORIZED Speaker Vic Templeman will start Tour No. 14 on April 13 and conclude April 27.

This tour will follow up the recent Milton Wildfong tour through the state of Washington and neighboring points in Idaho and Oregon.

For full particulars contact your local Section or write to Section 3, R.D. 12247, Technocracy Inc., 813 Pine Street, Seattle 1, Washington.

★ OVER two-thirds of a page of publicity were recently obtained for Technocracy through the efforts of 7943-1 (Toronto). A public lecture in the headquarters of this Section was reported in the February 16 issue of *News*, published in Toronto. Reporter Rod Young made a favorable though tongue-in-the-cheek analysis. We quote in part:

'Director Buzza strode sternly to the mike, saluted, and went into his Cassandra without a "ladies or gentlemen" or other such non-functional frou-frou. His subject: "Is It Comfort You Want or Certainty?" Evidently there is no room in the brave new world for both.

'The money system was a sitting duck. Technocrats now need not advance their own arguments. It was more fun to quote from Montague Norman, The Royal Bank and Wellington Jeffers. He smote hip and thigh the contradiction of an outdated price system in a technological age, leading up to an apocalyptical picture of banks and insurance companies drowning in their own liquidity. In those days the holders of debt certificates and the men walking the street will be in the same boat. No refrigeration. No transportation. No hospitalization. Disease. Famine.

' "Who will then oppose people who have a solution?" he asked. "Technocracy alone is designed to run this continent without money and on a balanced load . . . Make up your mind. Join Technocracy or your ancestors." '

TECHNOCRACY

WHAT?

Technocracy is science in the social field. *Encyclopedia Americana* says: 'Whatever the future of Technocracy, one must fairly say that it is the only program of social and economic reconstruction which is in complete intellectual and technical accord with the age in which we live.'

WHEN?

Technocracy originated in the winter of 1918-1919 when Howard Scott formed a group of scientists, engineers, and economists that became known in 1920 as the Technical Alliance—a research organization. Some of the better known names in the Technical Alliance are of interest, such as: Frederick L. Ackerman, architect; L. K. Comstock, electrical engineer; Stuart Chase, C.P.A. (now well-known writer); Bassett Jones, electrical engineer; Leland Olds, statistician (now Federal Power Commissioner); Benton Mackaye (now in the Forestry Department); Charles P. Steinmetz and Thorstein Veblen (both now dead). Howard Scott was Chief Engineer. In 1930 the group was first known as Technocracy. In 1933 it was incorporated under the laws of the state of New York as a non-profit, non-political, non-sectarian membership organization. In 1934 Howard Scott, Director-in-Chief, made his first Continental lecture tour which laid the foundations of the present Continental membership organization. Since 1934 Technocracy has grown steadily without any spectacular spurts, revivals, collapses, or rebirths. This is in spite of the fact that the press has generally 'held the lid' on Technocracy, until early in 1942 when it made the tremendous 'discovery' that Technocracy had been reborn suddenly full-fledged with all its members, headquarters, etc., in full swing!

WHY?

Technocracy's survey of the economic situation in North America leads to the conclusion that there is in development a process of progressive social instability, that this process will continue until the instability reaches the limits of social tolerance and that there then will have to be installed on this Continent a social mechanism competent to meet the needs of its people. Technocracy finds further that the day when social operations on this Continent can be based on a method of valuation has passed, and that it is now necessary that there be applied in the social field the quantitative methods of physical science. Technocracy, therefore, proposes that the North American Continent be operated as a self-contained functional unit under technological control. This control would operate the area under a balanced-load system of production and distribution, whereunder there would be distributed purchasing power commensurate with the resources and the continuous full-load operation of the physical equipment, with the guarantee of a high standard of living, equality of income, and economic security, at a minimum of working hours, to every adult inhabitant.

HOW?

At this stage the objectives of Technocracy are first, the education of the people of North America to a realization of the conditions behind the social crisis, and second, the organization of all those willing to investigate and interest themselves into an informed, disciplined, and functionally capable body whose knowledge and ability can be called upon to prevent chaos in North America at that time, now imminent, when the Price System can no longer be made to operate.

The Battle on the Home Front

THE DOMESTIC WAR is on—the status quo on the one hand, and planned social operations on the other. This battle is being fought in every village, office, board room, council chamber, and from every newspaper, magazine, microphone, and pulpit in America. Its outlines are obscured by the smoke screen of Price System propaganda. Technocracy is not quiescent or neutral. We are on the side of technology and all that it holds for the people of this Continent . . .

—CHQ, TECHNOCRACY INC.

(SECTION STAMP)

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